ASSESSMENT OF RICE HUSK AS RESIST AGENT FOR FABRIC DECORATION IN TEACHING AND LEARNING OF TEXTILE DESIGN IN COLLEGES OF EDUCATION IN NIGER STATE, NIGERIA

BY

Perpetua Ukwuoma NWOSU

M.ED/EDU/39297/2012-2013

DEPARTMENT OF HOME ECONOMICS,

FACULTY OF EDUCATION,

AHMADU BELLO UNIVERSITY

ZARIA, NIGERIA

JUNE, 2017

ASSESSMENT OF RICE HUSK AS RESIST AGENT FOR FABRIC DECORATION IN TEACHING AND LEARNING OF TEXTILE DESIGN IN COLLEGES OF EDUCATION IN NIGER STATE, NIGERIA

BY

Perpetua Ukwuoma NWOSU

B.ED ABU ZARIA, 2009

M.ED/EDU/39297/2012-2013

A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, AHMADU BELLO UNIVERSITY, SAMARU ZARIA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER IN HOME ECONOMICS EDUCATION DEGREE

DEPARTMENT OF HOME ECONOM ICS,

AHMADU BELLO UNIVERSITY SAMARU

ZARIA, NIGERIA

JUNE, 2017

DECLARATION

I declare that this dissertation titled: Assessment of Rice Husk as Resist Agent for Fabric Decoration in Teaching and Learning of Textile Design in Colleges of Education in Niger State, Nigeria, has been carried out by me in the Department of Home Economics. Ahmadu Bello University Zaria. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this work has been previously presented for another degree at this or any other institution.

....

Perpetua Ukwuoma NWOSU Date

CERTIFICATION

This dissertation titled ASSESSMENT OF RICE HUSK AS RESIST AGENT FOR FABRIC DECORATION IN TEACHING AND LEARNING OF TEXTILE DESIGN IN COLLEGES OF EDUCATION IN NIGER STATE, NIGERIA meets the regulations governing the award of the degree of Master of Education (M.Ed) Home Economics in Clothing and Textile of Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

..... **.....**

Dr. M. F. Ahuwan Date

Chairperson, Supervisory Committee

..... **.....**

Prof. S. L. Ajayi Date

Member, Supervisory Committee

..... **.....**

Prof. E. E. Adamu Date

Head of Department

Home Economics

..... **.....**

Prof. S. K. Abubakar Date

Dean, School of Postgraduate Studies

DEDICATION

This work is dedicated to God the Almighty who empowered and strengthened me to undergo this programme in good health of body and mind.

ACKNOWLEDGEMENTS

The researcher appreciates God Almighty for the good health of body and mind, wisdom and knowledge He granted her towards the successful completion of this work.

The researcher's profound gratitude and recognition goes to the members of her supervisory committee: Dr. M. F. Ahuwan, Professor S. L. Ajayi for their immeasurable and untiring efforts, inspiring attitude, constructive criticisms, advice, and guidance throughout the period of this research work. The researcher would as well like to appreciate her examiners: Prof. Gwari. Williams Bako. from Industrial Design and Prof. E. E. Adamu from Home Economics Department for painstakingly reading the work and making valuable corrections and suggestions where necessary. The researcher acknowledges the efforts, support and incredible guidance, contributions and suggestions of Dr. M. A. Khaleel the postgraduate coordinator, Head of Department Prof. E.E Adamu, Prof. P.E. Onuigbo, Professor A.Z. Mohammed, Prof. T.O. Ojo and Prof. I.E Ike, as well as Mr. Buhari and other staff of department of Home Economics. May the good Lord continue to strengthen them all for the good work they are doing.

The researcher would extend her sincere appreciation to Dr. Emmanuel I. from School of Education, Federal College of Education Kontagora for his assistant and guidance during the course of her data collection and analysis and Dr. F. Shittu for her assistance toward the success of this study. The researcher's sincere appreciation goes to her daddy and her lovely mummy, to her brothers and sisters and her wonderful cousins and their adorable wives for their moral, prayerful and financial support and help during the course of her study.

The researcher's special appreciation goes to her Head of Department Dr. A.A. Situ and Mrs. S. M. Utim, for the permission and support given to her during the course of this work, Dr. Aishatu Abubakar for her encouragement and motherly care and advice during the course of this work, Mrs. J. Ibrahim, and her other colleagues, friends and her neighbours for their wonderful assistance, contributions and prayers during the period of the study. Her special thanks go to her dear Emmanuel Ojiude for his incredible guidance, support, continuous encouragement, contributions and assistance in this work. She also is grateful to her dear little Perpetua for helping her in household chores. Mallam Surajo for his time to edit her manuscript. Sincere gratitude goes to her super woman Dr. Mrs U. V. Obiano for her encouragement and support, and wonderful Amaka Okanigbo for all their assistance to her each time she goes to Zaria. And her room mates at A16. May God reward them all abundantly and grant them all His favour and mercies as they journey in life. Amen.

ABSTRACT

This study used one shot experimental design to carry out an assessment on rice husk as a resist agent for fabric decoration in teaching and learning of textile design in Colleges of Education in Niger State, Nigeria, with the following objectives: teach respondents how to produce resist agent using rice husk, assess the suitability of rice husk as resist agent in teaching and learning of fabric decoration, examine the acceptability of fabric designs made from rice husk resist agent and compare the fabric designs produced from rice husk resist agent and cassava resist agent. The population of the study consisted of 80 students. A total sample of 35 students was drawn from the population using purposive sampling technique to respond to the instrument for data collection for the study. The instrument was a 25 item structured researcher's designed questionnaire titled Assessment of Rice Husk as a Resist Agent for Fabric Decoration in Teaching and Learning of Textile Design (RHRAFDTLTD) consisting of Part A and B, part A consists of demographic characteristics of respondents and part B provides information on the focus of the study. Mean and standard deviation were employed to answer the research questions. The results showed that resist agent can be produced from rice husk for effective teaching and learning of fabric decoration, there is no difference in the suitability of rice husk as resist agent for effective teaching and learning of fabric decoration. The study concludes that rice husk is a sustainable resist agent for fabric decoration in the teaching and learning of textile design, also fabrics designs made from rice husk resist agent were acceptable and there was no much difference in the comparison of rice husk and cassava resist agents. It was recommended that vocational and technical education departments in Senior High Schools, Polytechnics, Colleges and Universities could use the results of the study as resource material for teaching creative skills in textile design, also practitioners in the resist dyeing business should adapt the study to educate their students on the role rice husk plays in the production of resist agent for fabric decoration so as to encourage their use in practical lessons, vocational and educational institutions and textiles industry, Non-Governmental Organizations, public and private agencies involved in skills training and youth empowerment can engage their trainees in the production of rice husk resist agent , and constant demand of this husk could serve as a waste management, which will help to clean up the heaps of rice husk piled up at various milling factories and as such promote cleanliness to our environment and generate income to the rice growers and millers, as rice husk and its ash is a great environmental threat causing damage to land and surrounding area where it is dumped.

TABLE OF CONTENTS

TITLE PAGE	II
DECLARATION	III
CERTIFICATION	IV
DEDICATION	V
ACKNOWLEDGEMENTS	VI
ABSTRACT	VII
TABLE OF CONTENTS	VIII
LIST OF TABLES	XI
OPERATIONAL DEFINITION OF TERMS	XII
LIST OF APPENDICES	XIV
CHAPTER ONE: INTRODUCTION	
1.1 Background of Study	1
1.2 Statement of the Problem	4
1.3 Objectives of the Study	6
1.4 Research Questions	7
1.5 Significance of the Study	7
1.6 Delimitation of the Study	8
CHAPTER TWO: REVIEW OF RELATED LITERATURE	
2.1 Theoretical Framework	11
2.1.1 Colour Theory by Chapman (2010) and Goethe (1810)	11
2.1.2 Gestalt theory of visual perception by Max W., Wolfgang K., and Kurt K.(1920)	17
2.1.3 Design theory by Nigel Cross (2011) and Bas Leurs (2014)	22
2.2 Conceptual Framework	23
2.2.1 Concept of Fabric decoration	23
2.2.2 Concept of colour system	28

2.2.3 Concept of dye 33

2.2.4 Concept of resist dyeing 39

2.3 Review of related empirical Studies 47

2.4 Summary of Reviewed Literatures 56

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Research design 57

3.2 Population of the study 58

3.3 Sample size and sampling procedure 59

3.4 Instrument for data collection 60

3.4.1 Validity of the instrument 60

3.4.2 Reliability of the instrument 61

3.5 Procedure for data collection 61

3.6 Procedure for data analysis 75

CHAPTER FOUR: PRESENTATION AND ANALYSIS OF DATA

4.1 Analysis of bio data of the respondents 76

4.2 Answers to research questions 78

4.3 Summary of Major Findings 82

4.4 Discussions 83

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary of the study 87

5.2 Conclusion 88

5.3 Recommendations 88

5.4 Suggestions for further studies 89

REFERENCES 90

APPENDICES 97

LIST OF TABLES

3.1	Population of the study	59
3.3	Sample size	60
4.1	Percentage of respondents by gender	76
4.2	Percentage of respondents by age	76
4.3	Percentage of respondents by class level	77
4.4	Percentage of respondents by Institution	77
4.5	Research question one	78
4.6	Research question two	79
4.7	Research question three	81

LIST OF FIGURES

Figure 2.1: Similarity of object 18

Figure 2.2: Continuation of design 19

Figure 2.3: Closure of object 19

Figure 2.4: Proximity of object 20

Figure 2.5: Surrounding background 20

Figure 2.6 Additive Colour Wheel 26

Figure 2.7: Subtractive Colour Wheel 28

Figure 3.5.1: Rice husk 62

Figure 3.5.2: Antisol or CMC being mixed with water into a bowl. 64

Figure 3.5.3: The soaked (Antisol) CMC ready to be mixed with rice husk 65

Figure 3.5.4: Rice husk being measured into the antisol mixture 65

Figure 3.5.5: addition of rice husk into mixture of antisol & water to form the rice husk resist agent 66

Figure 3.5.6: Cassava and rice husk resist agents applied on the equal quantity of fabrics and left to dry 67

Figure 3.5.7: Cassava and rice husk resist agents applied with different techniques of resist method and left to dry 67

Figure 3.5.8: Rice husk resist agent applied on the surface of the fabric with object created technique (the blue bowl) 68

Figure 3.5.9: Application of rice husk resist agent with splashing technique 69

Figure 3.5.10: Application of rice husk resist agent with stencil technique 69

Figure 3.5.11 Application of rice husk resist agent with stencil technique 70

Figure 3.5.12: Rice husk resist techniques applied on the surfaces of fabrics and left to dry in the sun 70

Figure 3.5.13 Rice husk resist agent applied on the surface of the fabric using object shape technique 71

Figure 3.5.14: Fabric dyeing process 72

Figure 3.5.15: Dyed, re-patterned and dyed fabrics with rice husk resist agent 72

Figure 3.5.15: Dyed, re-patterned and dyed fabrics with rice husk resist agent 73

Figure 3.5.17: Dyed fabrics patterned with rice husk resist agent 73

Figure 3.5.18: Dyeing process of splashed technique with rice husk resist agent 74

Figure 3.5.19: Dyeing of fabrics designed with rice husk and cassava resist agent into a bowl 74

Figure 3.5.20 Dyed fabrics designed with rice husk and cassava resist agent 75

OPERATIONAL DEFINITION OF TERMS

Batik : is a piece of cloth made in the traditional manner and used especially in the traditional context – carrying various ornaments of a specific nature (batik ornaments) applied by means of a dye-resist technique using "batik-wax"

CMC or Antisol This is a whitish powdered environmental free chemical also known as Carboxymethyl cellulose(CMC) or cellulose gum, is a cellulose derivative with carboxymethyl groups ($-CH_2-COOH$).It is used primarily because it has high viscosity, is nontoxic viscosity modifier or thickener, and to stabilize emulsions in various products. Major source fibre is either softwood pulp or cotton linter.

Fabric decoration: is an act of changing the appearance of natural and synthetic surfaces of fabric by the application of traditional, stylized , digitized and illusionary techniques to embellish a product.

Mordants : are chemical solutions which can be used before, during or after the dye bath, thus preparing the fibre to receive the colour and also to control the actual hue obtained.

Resist is an act, technique or material that creates patterns on cloth by impeding dye from penetrating fabric.

Rice husk also called hulls or chaff is the outermost layer of protection encasing a rice grain. It is yellowish in colour and has a convex shape. It is slightly larger than a grain of rice, thus lengths up to 7mm are possible

Shibori: Is the Japanese term for varied methods of embellishing textiles by shaping a fabric and securing it before dyeing

Stencil: a piece of card plastic, paper, metal with a design cut of it, which can be painted over to transfer the design on the surface.

Surface design: is the art of changing the appearance of natural and synthetic surfaces by the application of traditional, stylized, digitized, and illusionary techniques to embellish a product.

Tritik : technique refers to simples stitches sewn into the cloth. They are tightly gathered to form the resist

Tsutsugaki: is a Japanese term which means the use of paste or wax as a resist on fabric.

Vat dye: the term vat dye is used to describe a chemical class of dyes that are applied to cellulosic fibre (i.e. cotton) using a redox reaction.

Wax block is a white or colourless soft derivable from petroleum, coal or o shale, that consists of a Mixture of hydrocarbon molecules, it is solid at room temperature and melt above approximately 37 oc, used as resist agent in fabric decoration.

LIST OF APPPENDICES

Appendix I: Letter of Introduction 97

Appendix II: Questionnaire 98
Appendix III: Lesson Plan 102
Appendix IV: Practical work pictures 105
Appendix V: Output Data 116

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The Rice husk also called hulls or chaff is one of the most widely available agricultural wastes in many rice producing countries around the world. Rice husk is described as the outermost layer of protection encasing a rice grain. It is yellowish in colour and has a convex shape. It is slightly larger than a grain of rice, thus lengths up to 7mm are possible. Typical dimensions are 4mm by 6mm. It is lightweight, having a ground bulk density of 340kg/m^3 to 400kg/m^3 (Ajay, Devendra ,& Om, 2012).

Rice husk waste has always been deposited beside the milling factories and no demand of it has been made by people around as it is neither good for animal feeding due to its low nutritional value nor for any other use as rightly stated by Warren and Farrell, (1990) that rice husk has no nutritional value for poultry as well as to other animals.

The well known use of rice husk in most rice producing countries is that it is usually dumped and burnt for heat or used as landfill. Burning of husk in ambient atmosphere leaves a residue, called Rice husk ash. For every 1000 kgs of paddy milled, about 220 kgs (22%) of husk is produced, and when this husk is burnt in the boilers, about 55 kgs (25%) of Rice husk ash is generated (Koteswara & Pranav, 2006). The disposal of rice hulls has been a substantial problem for rice growers and rice millers, since the hulls are not suitable for use as fertilizers and until it is disposed off either by open burning, burying or used as land fill. Burning of rice hulls also releases Carbon-monoxide to the atmosphere (which is poisonous). Space for burning is frequently not available in heavily populated areas and burning creates undesirable atmospheric pollution. Rice husk removal during rice refining, creates disposal problem due to less commercial interest and also, handling and transportation of Rice husk is problematic due

to its low density. Apparently, Rice husk and its ash is a great environmental threat causing damage to land and surrounding area where it is dumped. Therefore, commercial use of Rice husk and its ash is the alternative solution to disposal problem, and so this prompted the researcher to seek an alternative ways of utilizing the waste for useful purposes such as processing it as a possible resist agent for fabric decoration on cotton fabric (dyeing).

Resist dyeing is a term for a number of traditional and contemporary methods of dyeing textiles with patterns. Different methods are used to prevent dye from penetrating all the cloth thereby creating a pattern. According to (Vainker, 1990), a resist is a product or process that temporarily or permanently blocks fabrics ability to absorb another wet medium. There are three main categories of resist methods according to Vainker (1990), are the mechanical, chemical and ikat. The mechanical means tying (tie the fabric with strong rope before dyeing), stitching (sewing the fabric with thread and hand needle at close intervals pulling the fabric together so as to avoid dye penetration at the sewn areas) and folding (fold the fabric at desired areas before dipping into dye bath). The chemical method which include use of paste such as flour paste, glue and wax and this method involve drawing patterns with bee, candle or any other type of wax on the surface of the fabric before submersion in the dye). The ikat refers to textile in which the resist is applied to the thread or yarn before weaving.

Years ago, resist dyeing techniques has been widely used in Eurasia and Africa since antiquity. The first discovery of pieces of lining was from Egypt and date from the fourth century, the cloth was used for the mummies (around the 19th Dynasty, successful mummy maker made mummies by removing internal organs and moisture of dead body, and protecting dried remains, which were dressed up and kept for histories) that were soaked in wax then scratched with a sharply style, dyed with a mixture of blood and

ashes later washed in hot water to remove the wax. In Asia, this technique was practice in china during the tang dynasty (618-907), in India and Japan in the near period (645-794), and in Africa it was originally practiced by the Yoruba tribe in Nigeria, Soninke and Wolof in Senegal (Vainker, 1990).

Resist dyed fabric or traditionally-crafted fabric is an age-long traditional fabric, which arguably has its origin from the people of Egba, the present people of Abeokuta, where resist dyed fabric is produced with super craftsmanship, though manually. The production of resist dyed fabric had in the past generated lot of jobs and revenue for the Egba people. Although, resist dyed fabric was crudely crafted in the past, it used to have large patronage from the Yoruba people of Western Nigeria and some West African countries like Ghana, Ivory Coast, Republic of Benin, Togo, Mali, among others, who had seen resist dyed fabric as a day-to-day clothing material suitable for special outings and routine wears. Recently, resist dyed fabric is worn by all people of different cultures as they are sewn in different taste and styles though the patronage of the fabric dropped down due to high cost of the finished good and the uncontrolled importation of foreign wears coupled with abnormal taste for foreign especially made-in-Nigeria goods for Western or Asian made semi-finished and finished goods (Vinyl, 2008).

The study will make use of rice husk which is seen as a waste and convert it into raw material in the production of resist agent for fabric decoration in teaching textile design to students in colleges of education, Niger State. Niger state has two colleges of education namely College of Education Minna and Federal College of Education Konatgora. These two colleges run NCE and Degree programmes at various Departments including Home Economics. Niger state is in central Nigeria formed in 1976 and shares boundary with Kaduna and Plateau in the East and South-East respectively as well as with Sokoto in the North and Kwara State in the East, with state capital at Minna. The occupation of the

three main principal ethnic groups namely Nupe, Gwari and Hausa is farming. As far as rice production is concerned in Nigeria, Niger State plays great role in the production of rice (Aliyu, 2015). This, therefore make rice and its husk abundantly available.

1.2 Statement of the Problem

The researcher embarked on this study as a result of improper way of disposing rice husk by a small milling factory very close to her residence at Tunga-maje Gwagwalada Area Council of Abuja. The first time when the researcher saw these waste, she taught it was saw-dust, and asked why people could not use it as fire wood, but a neighbour nearby said that it was rice husk and it cannot be used as fire wood as it generate thick smoke which is not conducive for health. The neighbour further explained that the improper disposal of this waste has been causing problem to the area especially during the raining season as running water will carry it away and scatters the waste at different places and as such dirty the environment for the residents in that area. The researcher was curious about the better way of utilising this waste to avoid these problem caused by the waste, this stimulated the researcher to embark on this study in other to find out alternative ways of utilising the waste and also to generate wealth out of it for the betterment of the people and at the same time bring about new knowledge.

Furthermore, in the course of the study, the researcher being curious observed over ten milling factories within Niger state that this rice husk waste has always being deposited beside the milling factory and no demand of rice husk has been made by people.

It is obvious that in most Nigerian schools and colleges, whenever students are asked to conduct practical on textile dyeing, the one and only method being use in creating effects on the dyeing is the use of tie and dye method of resist dyeing and these knowledge is

being passed on from one generation to another. Many graduates of Textiles Science and Home Economics departments from Secondary schools, Colleges and Universities do not know or have the idea that there are other different methods and material for resist dyeing on fabric beside tie and dye resist method.

Another method which is known by some students who are knowledgeable in the field is the use of candle wax for resist dyeing. This method is most times turned down by students due to the non availability and high cost of wax blocks in the markets. In Kontagora Local Government Area, of Niger State, most of the markets there do not have or sell the wax blocks, and each time practical are conducted on resist dyeing methods, the students find it difficult to get wax block for their practical work. On the contrary, the students insist on buying candle sticks to melt and generate wax for their practical end up spending much money as a packet of candle consisting of eight (8) sticks cost around 140 naira and above. The question now is how many sticks can generate a good quantity of wax that can go round the fabric? Furthermore, getting the source of heat for the melting of the wax is another problem as most times the students have to bring source of heat like stove from their homes irrespective of distance where they are coming from. Therefore due to these reasons, most students just stick to tie and dye method of resist dyeing as it is much easier and convenient.

The researcher as a teacher taught of so many means of generating another resist agent in order to alleviate the students of these problems and has therefore tried to create an alternative resist agent by making use of rice husk which is a waste, and since Nigerians are good farmers of rice and rice is planted and process in most local governments in Niger state, therefore rice husk is always available at no cost.

Personal interaction with most millers and the rice growers shows that rice husk have no commercial use, this research seeks to find an alternative solution to its

indiscriminate disposal since its disposal posses as a great threat to the environment and society at large. Moreover, its bulky characteristics can make its transportation difficult. No wonder rice husk has always being abandoned very close to the milling factory causing danger to the neighbourhoods. Physically, rice husk itself (as distinct from Rice husk ash) is abrasive, light and bulky and this makes it difficult to handle. It requires large indoor space for storage, as it can be easily blown by the wind and even burning cannot solve the problems because it also releases pollutants which can cause respiratory problems to humans.

In most developing countries like Nigeria recycling of waste products (agricultural waste product) into useful product is rarely practiced. This has led to environmental problems such as pollution resulting into refuse heaps on streets, drainage system and water ways, which has in turn resulted to flooding on rainy days due to the blockage of the waterways. The government and other stake holders in the education sectors (Environmentalist) has done tremendous efforts in putting up drainages, regular environmental sanitations of most milling centres so as to help prevent the problems of insecurity of environment. In spite of these efforts there still lingers a problem, of rice husk waste in the environment. Problem of this study simply put in a sentence is: How can rice husk be used as a resist agent for fabric decoration in teaching and learning of textile design in Colleges of Education in Niger State, Nigeria?

1.3 Objectives of the Study

The objectives of this study was to carry out an examination on rice husk as a resist agent for fabric decoration in teaching and learning of textile design in Colleges of Education in Niger State, Nigeria. Specifically, the study was to:

1. Produce resist agent using rice husk
2. Dye fabrics patterned with rice husk resist agent

3. Examine the acceptability of fabric designs made from rice husk resist agent
4. Compare the fabric designs produced from rice husk resist agent and cassava resist agent.
5. Teach students how to produce resist agent using rice husk
6. Assess the performance level of students taught fabric dyeing with rice husk resist agent.

1.4 Research Questions

The study utilized the following research questions:

1. What is the acceptability level of fabrics dyed with rice husk resist agent?
2. How are the fabric dyed with rice husk and cassava resist agent rated
3. What are the performance levels of students taught fabric dyeing with rice husk resist agent.

1.5 Significance of the Study

This research will be beneficial in the following ways:

It will be of help to consumers of fabrics as it will provide cheap but quality and beautiful dyed fabric since the Rice husk waste will be utilised and be obtained at no or little or no cost for the teeming customers and lovers of fabrics that have resist patterns. Hopefully, the findings of this research will be of importance to Nigerian rice farmers and rice millers as it will overcome the challenges they face on rice husk disposal, which before now is seen as a waste but will now be an important raw material for the textile industry. The constant demand of this waste therefore may lead to source of revenue to them.

Also, since the rice husk waste constitute problem in the environment in terms of disposal due to its low density and demand, this research will help in the proper

utilization of the waste and at the same time promote cleanliness of the environment through its increased demand. The Nigerian Government will benefit from this study because the constant demand will help to reduce hips of rice husk dumped at various sites which constitute nuisance and pollution to the environment where it is dumped and invariably reduce government expenses on sanitations and still prevent further damages that could have been caused by the waste.

Furthermore, it will also be of benefits to producers and consumers in resist dyeing business as it will not only provide an alternative means of production in resist design but also provide a cheaper means of production and products, as the raw materials are easy to access and available at little or no cost.

It will also provide a means of showcasing and preserving our rich cultural heritage as different design showing Nigerian cultural symbols and signs will be produce using the rice husk paste. It will be of importance to Home Economics and Textile Design teachers and students especially those in textile field as it will help in teaching and learning and also provides alternative method of resist dyeing techniques. And finally, it will also serve as a reference for future research studies related to rice husk or in batik and fabric decoration.

1.6 Delimitations of the Study

This study was delimited to the following practical testing and experimentation on the utilization and assessment of rice husk as resist agent for fabric decoration in teaching and learning of textile design in the two Colleges of Education in Niger State which are Federal college of Education Kontagora and College of Education Minna. The research was delimited to cold water dyeing, cassava resist agent for comparison reasons, and cotton fabric of white origin (brocade) as different colours of vat dye were used to produce different patterns using rice husk resist agent.

The research was also delimited to resist dyeing method as the rice husk was prepared into resist agent with the help of Antisol (CMC) and water. This study was delimited to NCE I and II students and all lecturers handling clothing and textiles courses in Federal College of Education Kontagora and College of Education Minna. These two levels were chosen based on the fact that National Commission for Colleges of Education, made it compulsory in the Minimum Standards For Vocational and Technical Education 2012 edition that all Home Economics students at NCE I level, should offer the course titled introduction to textile science (fabric decoration) with course code HEC 112 and at NCE II level the course titled textile design with course code HEC 221, where students are taught how to pattern the fabric with different resist methods before dyeing.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Literature related to the variable of the study were reviewed and presented under the following sub headings:

2.1 Theoretical Frame Work

2.1.1 Colour theory

2.1.2 Gestalt theory of visual perception

2.1.3 Design theory

2.2 Conceptual Framework

2.2.1 Concept of Fabric decoration

2.2.2 Concept of colour system

2.2.3 Concept of dye

2.2.4 Concept of resist dyeing

2.2.5 Uses of Rice husk and its Ash

2.2.6 Applications of Rice husk Ash

2.3 Empirical Studies

2.4 Summary of Reviewed Literatures

2.1 Theoretical Frame Work

The following theoretical framework were used in the study

2.1.1 Colour Theory

The first recorded mention of fabric dyeing dates back to 2600 BC. Originally, dyes were made with natural pigments mixed with water and oil used to decorate skin, jewellery and clothing. Those same dyes were also used for painting prehistoric caves, which emerged in places like El Castillo, Spain, some 40,000 years ago. Today, 90% of clothing is dyed synthetically, and critics say one can tell the next seasons hit hue by the colour of the rivers in China. With colours one can set a mood, attract attention, or make a statement and can also be use to energize, or to cool down. By selecting the right colour scheme, ambiance of elegance can be created, warmth or tranquillity, or image of playful youthfulness can be conveyed. Colour can be the most powerful design element if used effectively**.** Colours affect us in numerous ways, both mentally and physically. Another scientist named Goethe (1810) reformulates the topic of colour in an entirely new way. Goethe stated that Newton had viewed colour as a physical problem, involving light striking objects and entering the eyes. Goethe realizes that the sensations of colour reaching the brain are also shaped by the perception of human vision and by the way the brains process information. Therefore, according to Goethe, what we the eyes see of an object depends upon the object, the lighting and the perception. Goethe seeks to derive laws of colour harmony, ways of characterizing physiological colours (how colours affect vision) and subjective visual phenomena in general. Goethe studies after-images, coloured shadows and complementary colours, he appreciates that the sensation of complementary colours does not originate physically from the actions of light on our eyes but perceptually from the actions of our visual system.

Cameron Chapman (2010) originated colour theory which he theorized as the art of mixing colours to achieve desired effects, according to the researcher, the way colours are combined can be used to create different feelings, expressions and responses. A common way to explain the relationships of the different colour is to display them in a colour wheel. His theory is guided on the basis of the following assumptions as different colours portray different significance. Some colours and their significance as described by Chapman (2010) are as follows:

Neutrals: Neutral colours often serve as the backdrop in design. They're commonly combined with brighter accent colours. But they can also be used on their own in designs, and can create very sophisticated layouts. The meanings and impressions of neutral colours are much more affected by the colours that surround them than are warm and cool colours.

Blue (Primary Colour): Blue is often associated with sadness in the English language. Blue is also used extensively to represent calmness and responsibility. Light blues can be refreshing and friendly. Dark blues are more strong and reliable. Blue is also associated with peace, and has spiritual and religious connotations in many cultures and traditions (for example, the Virgin Mary is generally depicted wearing blue robes). The meaning of blue is widely affected depending on the exact shade and hue. In design, the exact shade of blue selected will have a huge impact on how the designs that are perceived. Light blues are often relaxed and calming. Bright blues can be energizing and refreshing. Dark blues are excellent for corporate sites or designs where strength and reliability are important.

Red (Primary Colour): Red is a very hot colour. It's associated with fire, violence, and warfare. It's also associated with love and passion. In history, it's been associated with both the Devil and Cupid. Red can actually have a physical effect on people, raising

blood pressure and respiration rates. It's been shown to enhance human metabolism. Red can be associated with anger, but is also associated with importance (think of the red carpet at awards shows and celebrity events). Red also indicates danger (the reason stop lights and signs are red, and that most warning labels are red). Outside the western world, red has different associations. For example, in China, red is the colour of prosperity and happiness. It can also be used to attract good luck. In other eastern cultures, red is worn by brides on their wedding days. In South Africa, however, red is the colour of mourning. Red is also associated with communism. Red has become the colour associated with AIDS awareness in Africa due to the popularity of the RED campaign. In design, red can be a powerful accent colour. It can have an overwhelming effect if it's used too much in designs, especially in its purest form. It's a great colour to use when power or passion want to be portrayed in the design. Red can be very versatile, though, with brighter versions being more energetic and darker shades being more powerful and elegant.

Yellow (Primary Colour): Yellow is often considered the brightest and most energizing of the warm colours. It's associated with happiness and sunshine. Yellow can also be associated with deceit and cowardice, though (calling someone yellow is calling them a coward). Yellow is also associated with hope, as can be seen in some countries when yellow ribbons are displayed by families who have loved ones at war. Yellow is also associated with danger, though not as strongly as red. In some countries, yellow has very different connotations. In Egypt, for example, yellow is for mourning. In Japan, it represents courage, and in India it's a colour for merchants. In designs, bright yellow can lend a sense of happiness and cheerfulness. Softer yellows are commonly used as a gender-neutral colour for babies (rather than blue or pink) and young children. Light yellows also give a more calm feeling of happiness than bright yellows. Dark yellows and

gold-hued yellows can sometimes look antique and be used in designs where a sense of permanence is desired.

Orange (Secondary Colour): Orange is a very vibrant and energetic colour. In its muted forms, it can be associated with the earth and with autumn. Because of its association with the changing seasons, orange can represent change and movement in general. Because orange is associated with the fruit of the same name it can be associated with health and vitality. In designs, orange commands attention without being as overpowering as red. It's often considered more friendly and inviting, and less in-your-face.

Purple (Secondary Colour): Purple was long associated with royalty. It's a combination of red and blue, and takes on some attributes of both. It's associated with creativity and imagination, too. In Thailand, purple is the colour of mourning for widows. Dark purples are traditionally associated with wealth and royalty, while lighter purples (like lavendar) are considered more romantic. In design, dark purples can give a sense wealth and luxury. Light purples are softer and are associated with spring and romance.

Green (Secondary Colour): Green is a very down-to-earth colour. It can represent new beginnings and growth. It also signifies renewal and abundance. Alternatively, green can also represent envy or jealousy, and a lack of experience.

Green has many of the same calming attributes that blue has, but it also incorporates some of the energy of yellow. In design, green can have a balancing and harmonizing effect, and is very stable. It's appropriate for designs related to wealth, stability, renewal, and nature. Brighter greens are more energizing and vibrant, while olive greens are more representative of the natural world. Dark greens are the most stable and representative of affluence.

Black: Black is the strongest of the neutral colours. On the positive side, it's commonly associated with power, elegance, and formality. On the negative side, it can be associated with evil, death, and mystery. Black is the traditional colour of mourning in many Western countries. It's also associated with rebellion in some cultures, and is associated with Halloween and the occult. Black is commonly used in edgier designs, as well as in very elegant designs. It can be conservative or modern, traditional or unconventional, depending on the colours it's combined with. In design, black is commonly used for typography and other functional parts, because of its neutrality. Black can make it easier to convey a sense of sophistication and mystery in a design.

White: White is at the opposite end of the spectrum from black, but like black, it can work well with just about any other colour. White is often associated with purity, cleanliness, and virtue. In the West, white is commonly worn by brides on their wedding day. It's also associated with the health care industry, especially with doctors, nurses and dentists. White is associated with goodness, and angels are often depicted in white. In design, white is generally considered a neutral backdrop that lets other colours in a design have a larger voice. It can help to convey cleanliness and simplicity, though, and is popular in minimalist designs. White in designs can also portray either winter or summer, depending on the other design motifs and colours that surround it.

Gray: Gray is a neutral colour, generally considered on the cool end of the colour spectrum. It can sometimes be considered moody or depressing. Light gray can be used in place of white in some designs, and dark gray can be used in place of black. Gray is generally conservative and formal, but can also be modern. It is sometimes considered a colour of mourning. It's commonly used in corporate designs, where formality and professionalism are highly needed. It can be a very sophisticated colour. Pure gray are

shades of black, though other gray may have blue or brown hues mixed in. In design, gray backgrounds are very common, as is gray typography.

Brown: Brown is associated with the earth, wood, and stone. It's a completely natural colour and a warm neutral. Brown can be associated with dependability and reliability, with steadfastness, and with earthiness. It can also be considered dull. In design, brown is commonly used as a background colour. It's also seen in wood textures and sometimes in stone textures. It helps bring a feeling of warmth and wholesomeness to designs. It's sometimes used in its darkest forms as a replacement for black, either in backgrounds or typography.

Beige and Tan: Beige is somewhat unique in the colour spectrum, as it can take on cool or warm tones depending on the colours surrounding it. It has the warmth of brown and the coolness of white, and, like brown, is sometimes seen as dull. It's a conservative colour in most instances, and is usually reserved for backgrounds. It can also symbolize piety. Beige in design is generally used in backgrounds, and is commonly seen in backgrounds with a paper texture. It will take on the characteristics of colours around it, meaning it has little effect in itself on the final impression a design gives when used with other colours.

Cream and Ivory: Ivory and cream are sophisticated colours, with some of the warmth of brown and a lot of the coolness of white. They're generally quiet, and can often evoke a sense of history. Ivory is a calm colour, with some of the pureness associated with white, though it's a bit warmer. In design, ivory can lend a sense of elegance and calm to a site. When combined with earthy colours like peach or brown, it can take on an earthy quality. It can also be used to lighten darker colours, without the stark contrast of using white.

The relevance of this theory to the present study is that understanding how colour is formed and the relationships between different colours can help you to use colour more effectively in your designs. The theory of colour is a discipline that encompasses the meaning, combination and application of colours in design. Colour plays an important role in achieving a successful design, it enable designers incorporate colour to achieve a harmonious garment design, because balance, proportion, emphasis, unity and rhythm rely on colour. Study may give you a handy overview of all the important aspects to help you start making informed decisions and statements on the different types of colour.

2.1.2 Gestalt Theory of Visual Perception

In the 1920s a group of psychologists in Germany developed a series of theories of visual perception, describing how viewers group together different objects into groups or a single coherent whole when the separate elements are arranged together in a particular way. The prominent founders of the collection of this theories and principles are Max Wertheimer, Wolfgang Kohler, and Kurt Koffka. These theories attempt to describe how people tend to organize visual elements into groups or unified wholes when certain principles are applied. The term Gestalt means 'unified whole', which is a good way of describing the over-arching theme behind the principles formulated, if you collect together your design elements in an arrangement using one of the approaches, your design will feel more connected, coherent and complete. Gestalt psychologists argued that these principles exist because the mind has an innate disposition to perceive patterns in the stimulus based on certain rules. These principles are organized into five categories: Proximity, Similarity, Continuity, Closure, and Connectedness. It became prominent in Rudolf Arnheim's 1954.

Basic Gestalt Principles:

1. Similarity
2. Continuation
3. Closure
4. Proximity
5. Figure/Ground
6. Symmetry and order

Similarity: When objects looks similar to one another, viewers will often see the individual elements as part of a pattern or group. This effect can be used to create a single illustration, image or message from a series of separate elements. The similarity between different elements can be shape, colour, size, texture or value. The more commonality that individual elements have, the greater the sense of coherence.

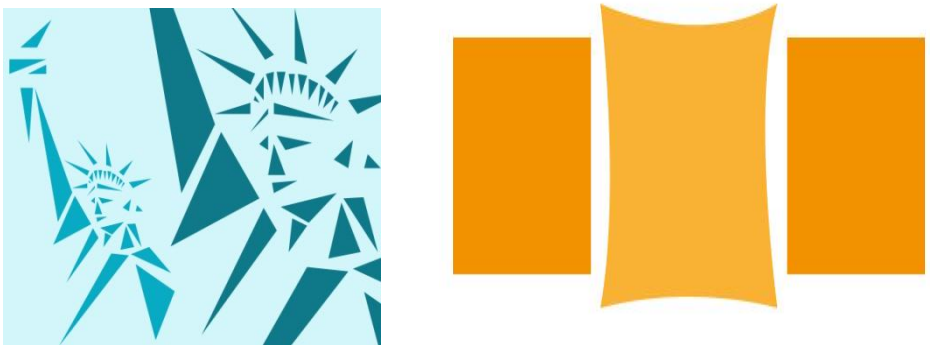


Figure 2.1: Similarity of object (Gestalt Principles)

Continuation: Continuation is the principle through which the eye is drawn along a path, line or curve, preferring to see a single continuous figure than separate lines. This can be used to point towards another element in the composition, and is seen where a line is cut through one object, often in a curve, aligning perfectly with a secondary element.

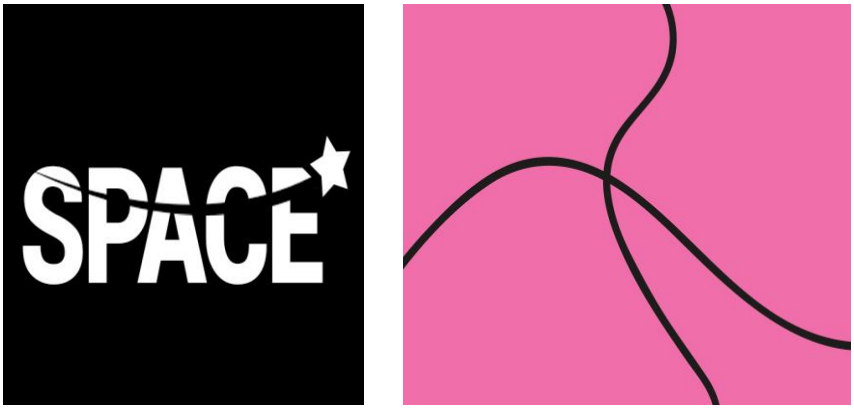


Figure 2.2: Continuation of design (Gestalt Principles)

Closure: Closure is a common design technique that uses the human eye's tendency to see closed shapes. Closure works where an object is incomplete or the interior space of an element is not fully closed, but the viewer perceives a complete shape by filling in the missing information. This technique is often associated with stenciled artwork, but is also closely associated with logo forms.



Figure 2.3: Closure of object (Gestalt Principles)

Proximity: Proximity is also known as ground, it uses the close arrangement of elements to create a group association between those objects. If individual elements are also similar, they will tend to be perceived as a single whole, even though they are separate elements. Proximity or grouping can be achieved with lots of different commonality including shape, colour, texture, size or any other visual attribute.



Figure 2.4: Proximity of object (Gestalt Principles)

Figure/Ground: This principle describes the eye's tendency to see and separate objects from their surrounding background. A classic example uses a vase/candlestick illustration to show two faces peering at each other, but you can also see this effect in a variety of logo designs. It works because human eyes want to see the figure (foreground object) and background (ground) as two different planes of focus. Everything that is not figure is considered ground, which can be used to create some interesting visual effects and tricks, particularly when the designer or artist introduces deliberate ambiguity.

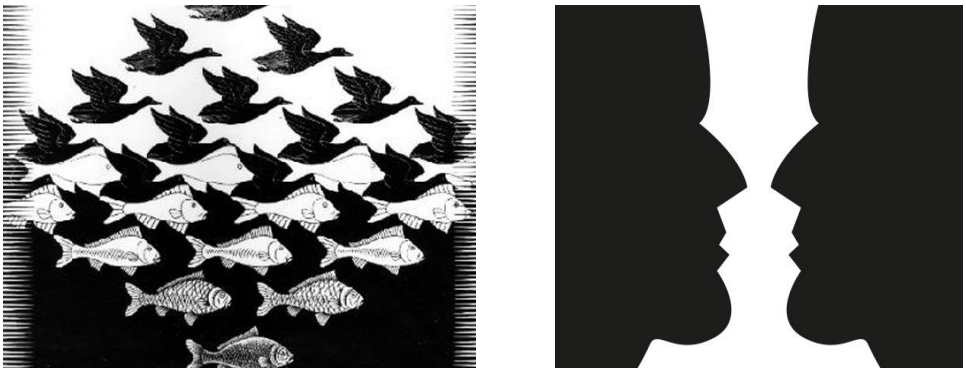


Figure 2.5: Surrounding background (Gestalt Principles)

Symmetry and order: Put simply, this principle says that a composition should not provide a sense of disorder or imbalance, as otherwise the viewer will waste time trying to locate the missing element, or fix the problem, rather than focusing on the message or instruction. You can achieve symmetry by providing a good balance or sense of symmetry in your design elements, such as the windmill illustration below. This provides the viewer with a feeling of harmony.

The relevance of this theory to the present study is that understanding these basic Gestalt principles which are similarity, continuation, closure, proximity, figure/ground, symmetry and order, plays very important role in achieving a successful design. It enables designers incorporate and to achieve a harmonious garment design, with unified whole. This approach enable the designer to collect together all the design elements in a well arranged manner to achieve more connected, coherent and complete art work. The researcher achieved similarity in this study by creating patterns using stencil, and also through the colours of dyes used. The principle of closure was achieved in this art work using stencil to create gaps in the work during the patterning with rice husk resist agent, thus giving room to the viewer to complete shape by filling in the missing information or shapes. Proximity was applied during the experiment by using shapes, colours and sizes imbedded in the stencils to get close arrangement of element to create group association between objects. The principles of figure achieved through all the fabrics produced during the course of this study, each of them have different background with different patterns which were arranged systematically to bring good effect to the viewers thus making them to see everything that is not figure as background. The researcher achieved the symmetry and order principle arranging the stencil to get a uniformed figures and patterns so as to provide a sense of order and balance in the design elements. Which give the viewers the feeling of harmony.

2.1.3 Design Theory

This theory was propounded by Nigel Cross in 1982. The theory describes and explains design activity that is what design is all about, why we actually design and how designers think and act. The author of this theory states that design ability is possessed by everyone. Everyone can and does design. We all design when we plan for something new to happen, be it a new version of recipe, new constructive approaches to garment making, new arrangement of the living room for furniture, so design thinking is something inherent within human cognition, it is a key part of what makes us human (Nigel, 1982). Design is a profession that is concerned with the creation of products, systems, communications and services that satisfy human needs, improve people's lives and do all of this with respect for the welfare of the natural environment. Design is not only about the product actually, it is about the effects achieved.

The theory states that arts make statement, while design work. That design is the ability to imagine that which does not yet exist, to make it appear in concrete form as a new purposeful addition to the real world. Design is equal to change, change is the difference, while change of difference is process, and change of process is evolution, while change of evolution is design. It is the ability to imagine that which does not yet exist, to make it appear in concrete form as a new, purposeful addition to the real world. (Harold & Erik, 2002).

Bryan Lawson & Kees Dorst (2009) Designers typically produce novel unexpected solutions, tolerate uncertainty, work with incomplete information, apply imagination and constructive forethought to practical problems and use drawings and other modelling media as means of problem solving. A designer is a planner with an aesthetic sense. Design is a continuum of processes, an endless but moving chain of development, realization, and evaluation, directed toward purposeful creation. Design as a mixture of

creativity and analyses, problem solving evolution, the creation of solutions to problems, integrating into a coherent whole a fundamental human activity.

The theory is relevant to the study in that it motivates every designer to try to make great effort in craving for higher things. It suggested that since design is the ability to imagine that which does not yet exist, making it appear in concrete form as a new purposeful addition to the real world. The researcher of this study made use of rice husk to produce resist agent which was a pure novelty idea, and thus contributed a new knowledge to the textile world.

2.2 Conceptual Framework

The following is the conceptual framework of the study

2.2.1 Concept of Fabric decoration

2.2.2 Concept of colour system

2.2.3 Concept of dye

2.2.4 Concept of resist dyeing

2.2.1 Concept of fabric decoration

Textile/fabric decoration is the art of changing the appearance of natural and synthetic surfaces by the application of traditional, stylized, digitized, and illusionary techniques to embellish a product (Eric, 2015). It is also the art of enhancing a surface's structure by applying three-dimensional techniques, such as weaving, knitting, embroidery, lace, divorce, beading, and embossing. Audubon (2009), states that some educators have described it as image, colour, texture, and pattern applied to surfaces within the man-made environment. Camila (2012) opined that Fabric decoration encompasses the colouring, patterning, and structuring of fibre, yarn and fabric. This involves creative exploration of processes such as dyeing, painting, printing, stitching, embellishing, quilting, weaving, knitting, felting, and papermaking. She further

mentioned that Fabric decoration is used to define all projects made by a designer, in respect to the graphic treatment and colour used on a certain surface, industrial or not. Evelise (2005) stated in Camila (2012) that Fabric decoration is a technical creative activity that aims to create bidimensional images (visual and tactile textures), projected specifically for the constitution and/or treatment of surfaces, presenting aesthetic and functional solutions to the different materials and processes of industrial and handicraft productions. Fabric design/ decoration is the patterning of an essentially plain fabric to render it more appealing or to serve a particular purpose. The reasons for decorating fabric vary with each individual, community or society and may be done for aesthetic, social, cultural, ritual, religious, political or economic reasons. These factors often determine the fabric type, processes, colour and motifs used. The word fabric is often used interchangeably with textile, cloth, and material. Though, these words or terms are used in loose manner and each has its own distinct definition, understanding these terms will help in identifying the different types of fabric available in traditional, contemporary communities. The word fabric is derived from the Latin word fabric are which means to make, build and fabricate. It is the generic 9class or group) term for all fibrous construct. Some fabric structure may be made directly by pressing and matting fibres such as bark cloth, felt other may be made by looping, knitting, knotting, netting , breading or weaving or plaiting. Fabric which are made by these techniques are constructed by interworking one single set of element e.g fibre with itself or themselves. The work textile refers to fabric structure made by weaving a set of parallel fibres with another set so that they cross each other at more or less right angle. The word or derived from the Latin word textere which means to weave. The term textile therefore refers to specifically to woven fabric, the term material can be misleading unless specified when using it. Material can be of any substance and used not to be a fabric at all e.g. a stone is a material thus when

talking of a textile material, it is best describe it as a textile material. For many people, the word material means plain or printed fabric. The word cloth usually refers to all types of textile fabric both woven or non woven

Fabric design refers to the artistic arrangement of motifs and colour on a chosen surface. Fabric design in this case can refer to the designing of a particular fabric structure and /or to the planning and arrangement of motif and colours or colours alone or the surface of such fabric structure. Fabric design by hand include tie and dye, batik, painting, block printing and stencil and screen, resist methods, appliqué and embroidery

Meinke (2012) opined that fabric decoration encompasses a wide variety of techniques for altering the surface of fabric, whether it is cotton, silk, wool or a synthetic fabric. The researcher further emphasis that Fabric decoration techniques can be used to create unique, original fabrics for your art quilts. Common techniques include fabric dyeing, painting, and printing, as well as digital image transfer. There are many different approaches within each of these categories: screen printing, immersion dyeing, stamping, and more. Altered fabric surfaces can be accomplished by any of the following techniques, either individually or in combinations:

1. dyeing fabric
2. stitching, either by machine or hand
3. painting on fabric
4. using a resist such as beeswax, soy wax or a water-based resist to separate colours and to create a design
5. printing on fabric
6. using heat transfer paints or crayons
7. adding colour, pattern and design with paint sticks

8. removing the colour from already dyed fabrics with a decolourant
9. layering different types of fabrics, as in a fabric collage
10. waxing
11. burning an image into the fabric to create a design or to reveal the layers underneath
12. rusting fabric
13. using various transfer mediums and transfer papers to transfer an image to fabric
14. digitally printing on fabric
15. felting onto a surface
16. embellishing with beads, crystals, buttons, charms, fibres and other found objects

He conceptualized fabric decoration in to:

1. The light or white or additive theory
2. The pigment or black or subtractive theory

Light theory starts with black, the absence of light. Red, green and blue are primary colours. Primary colours in this theory mean starting colours. The primary colours mix to make secondary colours: red and green make yellow, red and blue make magenta and green and blue make cyan. All three together add up to make white light. So, addition of all primaries makes them lighter and 'adds up to white' and so this theory is called additive or light theory

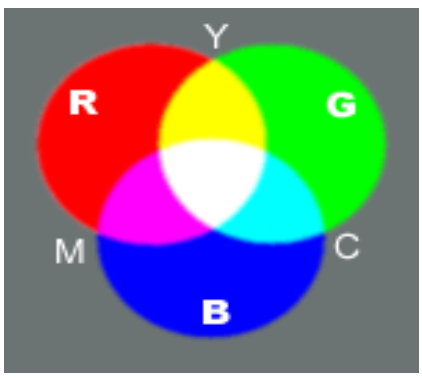


Figure 2.6: Additive Colour Wheel

The illustration (above) shows the typical demonstration of additive light mixtures, made by shining three overlapping circles of filtered light onto an achromatic (gray or white) surface. If the surface is illuminated by both the red and green lights, but not by the blue light, then the eye responds with the colour sensation of yellow. A magenta colour results from the mixture of red and blue violet light, and cyan from the mixture of blue violet and green. In additive colour mixing, yellow and blue don't make green, they make white! The "White" Colour Theory. It's handy to think of additive mixing as the "white" colour theory. Mixing light wavelengths from the "red," "green" and "blue violet" parts of the spectrum adds luminosity and negates hue to shift the mixture colour of lights from dim pure hues toward bright whites. The key principle is that the eye always adds together all the wavelengths of light incident on the retina, nothing is lost and it is this total light sensation that the eye interprets as colour.

This additive behaviour leads to an important constant in colour vision: the chromaticity and brightness of lights always predicts the chromaticity and brightness of their mixture, for lights from moderately dim to bright but not dazzling. This is true regardless of whether the lights are monochromatic (a very pure hue, as we see in homogenous or single wavelength light) or complex (as we see in a mixture of many different spectral wavelengths, for example a "white" light passed through a coloured filter).

Pigments behave almost the opposite to the above light theory. A coloured pigment, green for instance, absorbs most of the frequencies of light that are not green, reflecting only the green light frequency. Unlike in light theory, in the pigment theory when two colours are mixed, the two hues together absorb more light waves and colours appear darker. All colours of the spectrum when combined the resultant hue is black because all light rays are absorbed and no light is reflected **(**Anitha, 2005). Because all

colours other than the pigment colours are absorbed, it is also called the subtractive colour theory. A subtractive mixture absorbs light wavelengths that either colourant absorbs by itself. Subtractive mixture always increases darkness in material colours. This makes subtractive colour mixing the "black" colour theory. Mixing all three subtractive primaries produces a dark neutral, the opposite of white, because each paints subtracts or absorbs light that might be reflected by the other. Subtractive colour mixtures can only be made lighter by diluting the amount of pigment in the mixture with white paint or water; either remedy weakens the colour saturation. Therefore, subtractive mixture typically also reduces the hue purity (increases the grayness) in the colour of mixed substances.

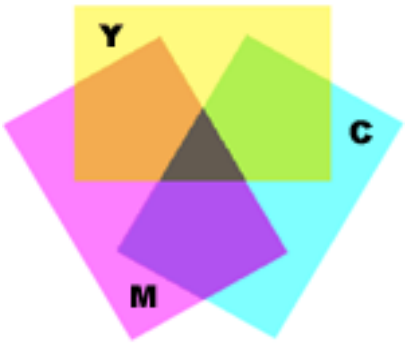


Figure 2:7 Subtractive Colour Wheel

2.2.2 Concept of Colour Systems

The main colour systems according to Chapman (2010) are:

1) Munsell Colour System:

This system is based on a unique colour-solid arrangement, which more accurately demonstrates hue, value and intensity of colour. In this system, a colours hue is given a number/letter destination, which locates it on the Munsell Colour Wheel. Paint, ink and coloured paper and other manufacturers often use this system because its alphanumerical system of notation allows for accurate description of a colour's hue, value and intensity between various remote parties. There are five primary and five

secondary hues in this system. The primaries are red, purple, blue, green and yellow. Hue, value and chroma are then rated with numbers. Colours can be very accurately described using this system. A three dimensional model using Munsell's system is called a colour tree. The colour is brighter at the outer edges of the tree.

2) Prang or Brewster Colour System:

By 1831 Brewster laid the groundwork for what has become known as the Prang theory. Its structure is simple, straightforward and practical. The most common colour wheel is based on the theories advanced by Louis Prang in 1876 and is commonly known as the Prang colour wheel. In most theories the hues on the colour wheel can be grouped as follows. It is a standard 12-hue wheel with 3 primaries, 3 secondary and 6 tertiary colours. Prang value has 9 steps from white to black and 7 steps in intensity from a full primary at the tip to its full compliment secondary at bottom.

i. Primary Hues: These are red, blue and yellow in the Prang colour system They are referred to as primary because they cannot be made by mixing other hues and all other colours can be made by them. The three primary hues are placed at equal distances from each other on the colour wheel.

ii. Secondary Hues: The three secondary hues are orange, green, violet (purple). They are made by mixing equal amounts of two primary hues together. They are found halfway between the primary hues on the colour wheel. Orange is made by mixing red and yellow. Green is made from equal amounts of blue and yellow. Violet is a combination of red and blue.

iii. Tertiary Hues: Intermediate hues (sometimes called tertiary hues) result when equal amounts of adjoining primary and secondary colours are combined. When naming them, it is customary to state the name of the primary hue first e.g. red-

orange is the tertiary between red and orange. Intermediate colours are blue-violet, blue-green, yellow-green, yellow-orange, red-range, and red-violet

Colours when combined should be used at the right proportion or else they clash and give an awkward appearance rather than being beautiful. There are a number of concepts about organization of colour. Colour schemes are the ways that colours are used together to give a befitting outfit. An understanding of well-known colour schemes helps us to achieve different results by using different combinations of colours. Successful or harmonious combinations of colours are based on the location of the colours on the colour wheel. The six basic colour schemes according to Feisner (2006) are as follows:

1. Monochromatic colour scheme: A monochromatic colour scheme is a one-colour plan that uses different tints, and shades. Neutrals such as black & white can be added to a monochromatic scheme for contrast and interest.
2. Analogous: They all have one hue in common so things can't get too wild. An analogous colour scheme uses neighbouring, or adjacent, colours on the wheel. It is sometimes called a related colour scheme since two or three "related" colours are used. To avoid monotony in clothing, use different values and intensities for some contrast. This means more freedom and expression potential. The combination of yellow, yellow-green, and green is an analogous scheme with three hues. In nature, the yellow, orange, and red of autumn is an analogous colour scheme. Also, the blue, aqua, and green of sky, water, and grass is analogous.
3. Complementary: This scheme uses colours that are opposite on the colour wheel (complements). Complementary colours are across from each other on the wheel. They have great contrast. In fact, the colours look even brighter when they are used side by side. Examples of complementary colour combinations are blue and

orange, violet and yellow, and red and green. Worn together in full strength, these colours can give a real jolt. However, when used in tints and shades, they can be sophisticated and pleasing. A soft tint of one is usually attractive with a deep shade of the other.

4. Split-complementary colour scheme: A split-complementary colour scheme uses three colours. It combines one colour with the two colours on the sides of its complement. First choose a colour and find its compliment in the colour wheel and then take colours on either side of the compliment. For instance, blue might be used with yellow-orange and red-orange. This is also a bright colour scheme, to be used with care in your apparel.
5. Triad colour scheme: A triad colour scheme combines three colours, which are of equidistant on the wheel. Examples are red, yellow, and blue, or purple, green, and orange. It has a great deal of contrast. To soften the contrast, one may choose to combine pleasing values and intensities. Wear a large area of one of the colours in a tint or shade and use small amounts of the other two for interest.
6. Tetradic (Double Complementary) Colour Scheme: The tetradic (double complementary) scheme is the most varied because it uses two complementary colour pairs. This scheme is hard to harmonize; if all four hues are used in equal amounts, the scheme may look unbalanced, so you should choose a colour to be dominant or subdue the colours.

Feisner (2006) informed that knowing about colour and its use is important in achieving a well dressed appearance. If not used well or combined well, colour can cause apparel to look too gaudy or very dull. Although fashion often bends the rules, colours in clothing are usually best used according to the following:

i. Black is good for formal wear. It tends to be sophisticated.

ii. Brown is casual, natural and informal

iii. Navy looks good on almost everyone and is good for sportswear or classic styles.

iv. For a tailored image beige and gray are to be chosen.

v. White looks good with all other colours. Off-white is better for most people than pure white.

vi. Red, green, and blue have many tints, shades and intensities which make these hues suitable for almost all occasions.

vii. Yellow is good for casual, fun clothes, but it is not pleasing for many skin tones

viii. Bright colours are fun for active sportswear or as accents with neutrals.

Using a colour with a neutral makes the colour appear brighter. Also, white and gray look brighter when placed beside black. Colours with medium or dark value look even darker when used next to a light area. Clothing outfits are generally more attractive if they do not have equal areas of light and dark. In most cases colours in clothes seem better balanced if light ones are used above dark ones. Colours of contrasting value are often exciting when used together. Extreme contrasts make colours look brighter. Observing the nature around is a useful exercise to understand the use of colour.

Colour is the most exciting design element, which has always attracted mankind. It is one of the most important elements of fashion design because it is the first thing noticed in a garment. Clothing is usually selected because of its colour. Colour is a property of light. It is a sensation, which occurs when light enters eyes. Responses to colour are immediate, inescapable and lasting. Colour enables mankind to express themselves and seem to affect the feeling. Some say that it reveals the personality of the wearer. Colour has the power to thrill and shock, irritate or soothe, attract or repel Anitha (2005). To experience, colour, three factors must exist. These are light, which the source of colour, a surface which reflects colour and the eye which perceives colour.

Colours react with each other and related to each other. The effects they give depend on how light, dark or strong the colours are. They also depend on how the colours are combined with other colours in a total outfit. Colours can appear to change the size and shape of the person wearing them. Dark, cool and dull colours make objects appear smaller than the same objects in warm, light or bright colours. The receding colours make the wearer smaller and black, navy blue, dark blue-violet, chocolate brown, dull dark green etc. on the other hand light warm and bright colours make a form seem larger due the colours advancing characteristics.

Such colours are white, yellow, orange and red. A single colour for an entire outfit makes a person look thinner and taller. When combining two colours in an outfit, special precautions are needed. Sharply contrasting colours appear to shorten the body. This effect can best be used for a very tall person, dividing the top the bottom of the dress. When two hues of identical tone are used together, they cause visual 'clashing' - colours appear to jump around glow and pulsate because they both compete equally for attention. This effect is usually reduced by changing the tone of one or both the colours. White unites and draws colours together while black separates colours. In most cases one should not use more than three major colours in an outfit. It is best to use one colour for a large area and another colour or two for smaller areas. Proper use of colour in a person's clothing will enhance his or her personal colouring. Students of Apparel design need to perceive the light and dark shades of a hue that appear on garments when folded.

2.2.3 Concept of dye

Primitive society discovered that certain roots, leaves, or bark could be manipulated, usually into a liquid form, and then used to dye textiles. They used these techniques to decorate clothing, utensils, and even the body. This was a religious, as well as functional practice. Records date all the way back to over 5,000 years ago chronicling

the dyeing of fabrics. According to Belfer (1972) excavated cloth fragments that date back to 3000 B.C. evidence the intricate dyeing practices and skills of India as well as hundreds of vibrant colours used to dye things in Peru. Certain hues have historical importance and denote social standing. For example, the colour "royal" purple was reserved for royalty and nobility not all that long ago (Belfer, 1972). The dye for this was made from the secretions of shellfish. Shellfish produce a clear fluid that oxidizes when exposed to the air; this was used to produce a red to bluish purple. This dye was difficult to create and used only on the finest garments; hence it became associated with aristocrats and royalty. Knowledge of this Tyrian purple was lost during the Middle Ages and not rediscovered until the mid-1800s by a French scholar (Belfer, 1972). Blue dyes were particularly difficult to come across and thus were viewed as a sign of wealth (Dye).

The colours one wore could even proclaim their sins, as chronicled in Nathaniel Hawthorne's book *The Scarlet Letter.* Ancient India was particularly advanced in dyeing techniques and has been known since the sixteenth century for their vibrant colours and designs on fabrics.Resist dyeing techniques probably originated here. Also, Indians discovered the use of mordant to make dyes fast and an integral part of the fabrics, not just a pigment on the surface (Belfer, 1972).

Some say the discovery of dyes was probably an accident, a simple stain from a berry for fruit, and dates back shortly after the dawn of civilization. Ancient man used almost exclusively vegetable dyes. Known roots and berries and various sorts of dyestuffs were gathered, boiled, and then fabrics and textiles were submerged, resulting in the first dyed products. In this way many new dyestuffs were discovered. In fact, numerous writers have confirmed the knowledge of over one thousand sources of dyes (Leggett, 1944). As trade and commerce developed, certain dyes were regarded as better

than others, and some ceased being used. Natural dyes used included vegetable, animal, and mineral dyes.

In 1856, Sir William Perkin made a discovery that some even say changed the world. He discovered the colour mauve. This was the first synthetic dye. His method for the dyeing of this colour, using coal and tar, resulted in many scientific advances and the development of synthetic dyes that are widely used today (Garfield, 2001). No matter which dyeing technique is used, natural or synthetic, water is required to complete the process. In order for water to be usable, it must be purified. Depending on the source of the water, it may contain an excess of carbon dioxide, bicarbonates, sulphates and chlorides of calcium, magnesium and sodium. Water can be identified in the three following broad categories: Well or spring waters, moorland waters, and surface waters. Well water is usually clear and of constant composition. It may have some sodium bicarbonate, bicarbonates of calcium, magnesium, and iron, as well as free carbon dioxide. Moorland water may be tinted and somewhat acidic. The colour and acid in this water is from organic materials. The acidity and some dissolved gases may make this water corrosive. It may contain calcium chloride, magnesium chloride, and sulphates. Surface water contains sulphates, chlorides, calcium bicarbonate, and magnesium bicarbonate as well. These impurities must be removed to the limits of suitable water quality (Peters, 1967). After water is treated for turbidity and colour, iron and manganese, alkalinity, and hardness of water, it can be used in textile mills.

Today, with the invention of synthetic materials used in textiles, many new types of dyes have been developed and put into regular use. There are two basic ways to colour textiles: dyes and pigments. Pigments are not a dye but rather resins mechanically bound to fibres. Conventional, or aqueous, dyeing is the most common colourization technique. Dyes are divided into classes according to the types of fibres they are most compatible

with. The most notable are: acid dyes, premetalized acid dyes, chrome dyes (mordant dyes), cationic dyes (basic dyes), direct dyes (substantive dyes), direct developed dyes, disperse dyes, naphthol dyes, reactive dyes, sulfur dyes, and vat dyes (Price, Cohen, &Johnson, 2005).

i. Acid dyes are used on protein fibres, nylon spandex, and special type acidy able acrylic fibres. Acid dyes produce bright colours that have excellent fastness, or the ability of the dye to stay on the fabric and not rub off or fade, to dry cleaning, but not necessarily to washing or light and perspiration.

ii. Premetalized acid dyes and chrome dyes are used for the same types of fibres, but premetalized acid dyes are less bright with better fastness to light and sweat. Chrome dyes result in dull colours and have excellent fastness to light, washing, and perspiration. They are great for wool and carpets.

iii. Cationic dyes are generally used for acrylic, modacrylic, cationic dyeable polyester, cationic dyeable nylon, cellulosic, and protein fibres. They produce bright colours that have excellent fastness to light, laundering, perspiration, and crocking on synthetics fibres, but poor fastness to washing and light on natural fibres.

iv. Direct dyes are used on cellulosic fibres and have excellent fastness to perspiration and dry-cleaning, but poor fastness to washing and varied light fastness. Direct developed dyes are used on the same cellulosic fibres, but have good to excellent fastness to laundering. Disperse dyes are used for acetate, acrylic, modacrylic, nylon, polyester, and olefin fibres. The wash fastness with disperse dyes varies with the fibres- poor on acetate, excellent on polyester. Fastness to light is fair to good, but there is some gas fading on acetate. However, fastness to perspiration, crocking, and dry-cleaning is excellent.

v. Naphthol dyes are employed for cellulosic fibres. They create bright shades of colour with varying fastness to light. However, they have good fastness to washing and perspiration.

vi. Reactive dyes are primarily utilized on cellulosic fibres, but occasionally on protein fibres and nylon as well. They generate bright shades with great to excellent fastness in all areas, but are difficult to match shades.

vii. Sulfur dyes are used on cellulosic fibres as well to create dull shades such as navy, black, and brown. They have excellent fastness in most areas, but are weak when exposed to chlorine.

viii. Vat dyes have excellent fastness in all areas as well, especially to chlorine and bleach, however, if not properly applied, they may crock. Vat dyes are used on cellulosic and are very much available in different colours and in our local shops in Nigeria. Finally, pigments, which are not a dye, can be used on all fibres. This is because pigments are bound to the fibre by resins and do not need to be absorbed. However, they are susceptible to crocking. Dyeing can be done in the garment, fabric, yarn, fibre stage, and sometimes even before, which is called stock dyeing Vat dyes are a class of dyes that are classified as such because of the method by which they are applied. Vat dyeing is a process that refers to dyeing that takes place in a bucket or vat. Almost any dye, including fibre-reactive dyes, direct dyes, and acid dyes, can be used in a vat dye. Cotton, wool, and other fibres can be all dyed with vat dyes. The original vat dye is indigo, once obtained from plants but now produced synthetically.

Although almost all dyeing can be done in a vat, the term vat dye is used to describe a chemical class of dyes that are applied to cellulosic fibre (i.e. cotton) using a redox reaction. Because of the use of caustic soda, and the very high pH of the dye bath

in the dyeing process, wool cannot be dyed using vat dyestuffs. Wool is soluble in caustic soda solutions. It is possible to dye wool at room temperatures with indigo (vat blue 1) and other low substantive vat dyes using soda ash as the alkali source with very little strength loss. Vat red 10, vat violet 13 and vat orange 1 can be applied in this manner as well. Some of its Advantages: Excellent colour fastness, Less impurities, Excellent solubility, High strength, High quality, Physical Properties:, Appearance : Powder/Grain, Properties: Good solubility in water, Usage: Mainly used in cotton and fabric etc. , Storage: Must be stored in shade ,dry and well-ventilated warehouse . Keep it away from sunlight

Found amongst the oldest natural colouring substances used for textiles, the vat dyes offer first-rate fastness properties. They are so named because a vat (which means a bucket or a container) is used for the process of dyeing!

Although, other dyeing can also be done in a vat, but the term vat dyes specially describes the class of colouring substances that are applied to cellulosic fibre (fibres come from plants or plant based materials. For example, cotton) using a redox process (Price, Cohen, & Johnson, 2005). Some of its properties includes: Superior colour fastness properties, which are exceptional in other dye classes, Needs vatting for application, Water insoluble dyes, A number of colours can be produced, Rubbing fastness is not good, but is can be easily lessened with special treatments to the fabric, Especially used for cellulose fibre with PH (measure of hydrogen ion concentration) control.

Classification of Vat Dyes:

Depending upon the properties one popular classification of vat dyeing substances has been developed which is given below:

- The 1N (indanthrene normal)-group of dyeing temperatures of 600C. In such dyeing substances no salt is added to the dye bath because they have high portion of leuco dyes for cotton.
- The 1W (indanthrene Warm) - group of dyeing temperatures of 500C. In such dyeing substances some addition of salt is required so to aid exhaustion.
- The IK- group of dyeing substances requires low concentration of NaOH with dyeing temperature of 200C.

One special type of vat colouring agents is light-oxidized vat dyes that use light rather than oxygen in order to produce wide range of colour effects along with colour fastness. Elaborately, these colouring agents which are chemically similar to the vat colouring materials developed in light rather than dipping in the oxygen-free bath and exposing into the air. Dye itself attached to the fabric.

There are several ways to conduct the dyeing process. Dyeing is the process of adding colour to textile products like fibres, yarns, and fabrics. Dyeing is normally done in a special solution containing dyes and particular chemical material. After dyeing, dye molecules have uncut chemical bond with fibre molecules. The temperature and time controlling are two key factors in dyeing. Many techniques are intricate and decorative.

2.2.4 Concept of Resist Dyeing

Resist dyeing as special dyeing method, has been recognized as a unique design technique. Wada (2002) defines resist as “technique or material that creates patterns on cloth by impeding dye from penetrating fabric”. Resist can be defined as a process of textile colour patterning “by preventing the uptake or fixation of a dye in a subsequent operation” (McIntyre & Daniels, 1997). Resist dyeing has been historically created in

many ways throughout the world, such as wax resist, tied resist, pattern-dyed indigo and shibori (Bosence, 1985). Although many researchers (Belfer, 1977; Bosence, 1985; Wada, 2002) point out that most resist patterns have been created on woven fabrics, resist dyeing techniques can be divided into different groups including batik (wax resist), shibori or plangi (tied fabric resist) and ikat (yarn resist) according to the interpretation of the classification. Cultures around the world have developed an array of resist dye techniques.

Dyeing provides rich colours but once the fabric has been coloured in a dark shade, lighter colour patterns will not show up. In order to allow lighter colours to come through, areas have to be blocked from receiving dye. Any of these techniques of blocking the dye are referred to as a "resist." Sometimes these techniques have arisen independently; sometimes the techniques have been passed across cultures through trade and exchange. In many cases the origins have been lost to time, leaving only rich and remarkable textile traditions. Resist techniques can be seen in the most expensive and treasured textiles, but also in relatively humble objects. According to Neil (2007) resist dyeing was employed by certain primitive people, resist dyeing of fabric means first treating it to in such as a way that when it is dyed normally later on, the treated portion cannot hold the colour. Today, this technique has important industrial applications and the desired result is obtained by employing particular specialised chemical treatments. The primitive people were naturally without modern technology knowledge. However, they succeeded equally well in producing coloured designs on non-dyed material by preventing the dye-bath from penetrating portions of the fibre by means of a physical According to Neil (2007) resist agent can be classified as follows:

a. Methods which is created by a mask, an impervious strip which stops the colour from penetrating

b. Methods of folding to make the penetrating of the dye different

c. Methods of binding to stop the colour from penetrating the bound parts

d. Methods which involve the introduction of foreign bodies (stones, leaves, seed, etc) used in such a way to prevent the penetrating of the dye with the evidence of primitive tribe in mind, some scholars have deduced that these textile decoration processes were prehistoric forerunners of a true and proper printing, as man did not then have the tools necessary to create fine block.

The remote origin of resist dyeing cotton textiles work and beeswax removed after dyeing might be traced to certain far eastern countries where it could have been developed, evolved and refund into the dedicate batik. The exhibition is organized by technique in order to bring together examples from around the globe. The objects are grouped into three main categories of resist methods:

A. Mechanical

B. Chemical

C. Ikat

A. Mechanical resist

The dye can be resisted using mechanical means by tying, stitching or folding. There are different methods of mechanical resist dying. They are:

1. **Shibori**: Is the Japanese term for varied methods of embellishing textiles by shaping a fabric and securing it before dyeing (Wada, Rice & Barton, 1999). Shibori may be utilized to create a variety of patterns on a fabric by means of a resist-dyed technique. Wada et al (1999) indicate that shibori designs, composed of binding, stitching, folding, and pole-wrapping, that appear on fabric are the

result of the three dimensional shape of the fabric even if the fabrics may be returned to a two-dimensional form after dyeing.

2. **Tie-dye**: Is a technique that has become familiar to many Americans because of brightly coloured t-shirts popular in the 1960s and 70s. The technique of tying off sections of cloth or garments before treating it with dye has been around for centuries. Japan and India are among the many parts of the world with long traditions of tie-dye. While most of the examples of mechanical resist techniques in the collection are variations of tying and binding with thread, other methods such as clamping and pole-wrapping can also be used. While these techniques have been practiced for centuries and are performed by highly experienced artisans, there is always an element of randomness and chance to the results. The subtle variations in shade and pattern are intrinsic to the beauty of the handmade pieces.

3. **Raffia Resist**: When raffia is tied around the cloth to act as a resist the cloths are known as adire oniko. A great variety of patterns can be produced using this method. For example, small circles can be created by tying small stones or seeds into the cloth and larger circles can be made by lifting a point of fabric and then binding the fabric beneath it tightly. This cloth is an example of adire oniko (the pattern of was known as olosupaeleso or ‘moons and fruit’ in Ibadan, Nigeria when this cloth was purchased). Using these two different types of circle in various combinations and arrangements can create a wide variety of patterns. Sometimes a specific combination of circles would be given a name but the names often varied from town to town or changed over time. In 1964 in the city of Ibadan five rows of large circles with small circles filling the rest of the cloth was known as olosupaeleso which means moons and fruits.

Another way that patterns could be created using raffia was by folding the cloth from corner to corner like a concertina and then binding it very tightly at various points.

4. **Stitch Resist**: When the two pieces of dyed cloth were stitched together a diamond shaped pattern is created with alternating blue and white stripes. The broadness of the stripes can be varied by the intervals at which it is bound.

   The term adire alabare is used when sewing has been used as a means to resist the dye. If the sewing has been done with raffia then it would be a form of adire oniko. Both machine sewing and hand sewing could be used to produce patterns. Although adire cloths were usually made by women and the cloths that used a sewing machine were made by men.

5. **Starch Resist**: Cloths decorated by using starch made from cassava flour to resist the indigo dye were known as adire eleko. The starch was only applied to one side of the cloth so the underside would be plain blue. The use of starch allows for a greater variety in the patterns that can be created. Starch could be applied through a stencil or painted on to the cloth freehand.

   Like machine sewing, both cutting the stencil and using it were activities performed by men. The starch was applied using a piece of metal; a comb-like device could be used to create patterns in thickly applied starch. The size and complexity of the stencils varied a great deal. One of the most common stencilled designs features King George and Queen Mary at its centre. The image was originally taken from souvenirs produced in 1935 to celebrate the silver jubilee

6. **Hand Painting**: Hand painting was probably the most time consuming way of producing adire and these cloths were not subject to the same rapidly changing fashions as the adire oniko designs. The painting was done by women using

chicken feathers, the mid rib of a palm leaf and matchsticks to create different thicknesses of line. Hand painted cloths was usually divided up into squares or rectangles which would then be filled in with a variety of patterns.

The centre of production for hand painted cloths was the city of Ibadan. The city itself was celebrated in one of the common pattern which was known as Ibadan dun, 'Ibadan is good' in Yoruba. This pattern takes its name from one square in particular which shows the pillars of Mapo Hall (Ibadan's town hall) alternating with spoons. Cloths, particularly hand painted ones, were often signed on the hem and this is one of two in the museum that has been signed using a symbol that appears to be a scorpion. The symbol also appears on the front of the cloth in several places suggesting that having a cloth painted by this woman is something the owner would be keen for people to know. Unfortunately it has not been possible to associate the symbol with a name. In chemical resist, the resist can be chemical, generally paste or wax. Examples are Batik, adire eleko, tsutsugaki, modrotlac.

7. **Batik dyeing**: The term batik is said to have been derived from the Malay word '*tik' which means* 'to drip' or 'drop'. However, it is likely that the principle was discovered independently in several different areas. Dunsmore (1996) expatiated that the earliest known batiks dated to the 5th-6th century AD, were evacuated in Egypt and include a linen cloth with white patterns showing biblical scenes blue background. It was first practiced by the ancient Egyptians but it reached its highest development in Java, where it has been since the 7th century AD. In addition, the technique is claimed to have been more than a millennium old, that historically evidence indicated that the cloth decorated through some form of resist technique was in use in the early centuries AD in several West African,

middle-eastern and Asian communities. However, Dunsmore (1996) substantiated the claims that in West Africa resist is an ancient tradition that is practised with the main centres of production in West Africa, in Nigeria, Senegal, Sierra Leon and the Gambia. Kerlogue (2007) came to the conclusion that the earliest known written reference to "batik "is almost certainly in the Dutch bill of landing of 1641 connected with a shipment of cargo from *Bataria* in Java to Bengkulu on the west coast of *Samatra*. However, it is the researcher's opinion that whether the word was used to refer to precisely what we call "batik" today is uncertain. Due to many years of practical experience, Quick (1977) came to the conclusion that Batik is a resist technique for applying colour and design to fabric and that each colour dye protected by wax coating before the next colour is applied. Furthermore, Dunsmore (1996), attested to this evidence that resist dyeing technique, patterns are created on cloth (usually on dyed cotton or silk) by painting, or stencilling design in wax , rise, or cassava paste, mud, or some other dye assistance substance on the area intended to retain their original colour after dyeing. Patterns are applied in hot wax onto a piece of un-dyed cloth, usually cotton.

It is evidently clear that, there are examples of batik textiles in many part of Africa. The Batik Guild Report (1999) states that the most developed skills to be found in Nigeria where the Yoruba people make *adire* cloths. However, Wolf, (2005) agreed that *adire*: is a resist-dyed cloth produced and worn by the Yoruba people of south western Nigeria in West Africa. The Yoruba label *adire*, which means "tied and dyed. "Was first applied to indigo-dyed cloth decorated with resist patterns around the turn of the twentieth century. Moreover, Art partner online agreed that *Adire* cloth comes from Nigeria. The Batik Guild Report

(1999) went further, to claim that there are two types of methods of resist that are used: *abire eleso* which involves tied and stitched design and *adire eleko* where starch paste is used. However, Brooklyn, (2008) claimed that with the introduction of a broader colour palette of imported synthetic dyes in the second half of the twentieth century, the label "*adire*" was expanded to include a variety of hand-dyed textiles using wax resist batik method to produce patterned cloth in a dazzling array of dye tints and hues. Africa textile online also claimed that the design is created by a process called resist dying, which prevents dye from being absorbed by some parts of the cloth. Moreover, Wolf (2005) further claimed that there are different types of resist dying methods used to create *adire* cloth designs. *Oniko* is a method of tying patterns into the cloth. *Eleko* designs are stenciled or painted onto the cloth with starch (usually from cassava or yam). While another method, called *Alabere,* uses raffia to stitch designs into the fabric.

The imported sheeting's smooth finish and tight weave allowed designs to be painted on its surface with a cassava starch paste - a process impossible on the softer, more loosely-woven hand-woven fabric. The paste is applied with a feather or a broom straw and carefully dried, after which it is dyed. The starch is then removed, leaving a white pattern on a blue background. Today stencils, printing blocks and wax are also used.

2.3 Review of Related Empirical Studies

Rice husk is an agro-waste which is produced in about 100 million of tons. About 108 tons of rice husks are generated annually in the world. In Nigeria about 2.0 million tons of rice is produced annually (Oyetola & Abdullahi, 2006). Approximately, 20kg of Rice husk are obtained from 100kg of rice. Rice husk ash is a general term describing all types of ash produced from burning Rice husks and Rice husk ash is the residue remaining after burning Rice husk.

Karim, Zain, Jamil, Lai and Islam (2012) investigated the Strength of Mortar and Concrete as Influenced by Rice husk Ash. The aim of the study was to review the influences of Rise Husk Ash on the strength of mortar and concrete and the advantages and disadvantages of supplementary use of Rise Husk Ash in mortar/concrete. Chindaprasirt, Jaturapitakkul and Rattanasak, (2009) stated that after burning of Rice husk, the ash produced as a by product is about 20% of the original weight and the unburnt Rice husk contains about 50% cellulose, 20 – 30% of lignin and 25 – 20% of silica.

The research revealed that the incorporation of Rice husk ash in cement or in concrete not only fulfils the demand of cement but also makes a role in production of durable concrete. Also the strength development of concrete produced with a particular level of rise husk ash is the same or higher as compared to Ordinary Portland Cement (OPC) concrete.

Karim et al study differs from this present study as it burns rice husk and uses the ashes in the production of cost effective concrete which is suitable and sustainable for construction work while this research deals with the use of rise husk for the production of resist agent for fabric decoration. The similarities lies in the fact that both studies used rise husk as their main raw materials and that both research are working on the various

ways to reduce the environmental pollution done by indiscriminate dumping of Rice husk by rice milling factories in developing countries and are proffering useful way of utilizing the waste product.

Another study was carried out by Bello and Adegbulugbe (2010) on the Comparative Study on Utilization of Charcoal, Sawdust and Rice husk in Biomass Furnace-Dryer. The main aim of the study was to ascertain the effectiveness of biomass furnace-dryer on the three bio fuels namely charcoal, sawdust and rice husk. Three tests were replicated on each fuel and the mean values used to evaluate heat flow by conduction, radiation and the thermal efficiency of the biomass furnace-dryer. The performance characteristics of the biomass furnace-dryer, including overall efficiency, and thermal capacities of each fuel were evaluated.

The results indicated that charcoal exhibit the highest thermal power expressed by temperature increase, 4.08 kW. Burning of sawdust was slower, and the thermal power lower, 3.56 kW. Rice husk has the least thermal power of 2.93kW as a result of low differential temperature (difference between the highest and lowest temperatures) and its combustion was followed by emissions with dark exhaust gases. Also Observed temperature rises and characteristic temperature curves in the drying chamber indicated that charcoal attained very high drying temperatures and increase within a short period than other fuels, while sawdust and Rice husk have much lower heat build-up and longer temperature rise response time. By these results, charcoal are suitable for short time heat processes such as baking and roasting, Rice husk could be suitable for milk and fruit juice pasteurization, which require heat processing conditions of between 63-85° C for about 15 to 30 minutes. Sawdust can be used in sterilization of meat, fish, soup etc. Charcoal is more environmental-friendly than the other products because of the smokeless burning process thus suitable for indoor cooking.

Bello and Adegbulugbe study have something in come with the present study. Both studies worked on the effective utilization of the abundant Rice husk from rice mills. There difference being that Bello and Adegbulugbe worked on Rice husk as a bio fuel, this study worked on Rice husk as resist agent.

Akeke, Ephrai., Akobo, and Ukpata, (2013) experimented on Structural Properties of Rice husk Ash Concrete. The main aim of the study was to investigate the effects of introducing Rice husk Ash (RHA) as a Partial Replacement of OPC on the Structural Properties of Concrete. The study also investigated the flexural properties to determine their moduli of rupture as well as its tensile strength characteristics for the determination of cracking.

The research proved that RHA Concrete can be used as a Structural Concrete at suitable replacement percentages. The research also revealed that RHA concrete can partially replace OPC as it poses high structural integrity and good properties. The husk, if burned at high temperatures in the presence of oxygen, yields ash with a high content of silica (more than 90 percent by weight) which is seen as the most advantageous property of rice husk ash compared to ash obtained from burning other solid fuels (Muthadhi, Anitha, & Kothandaraman, 2007). However, the burning conditions of Rice husk result in different forms of Rice husk ash namely; the crystalline and the amorphous forms; and these different forms benefit different applications. While amorphous silica had been proven to be useful in the cement, construction, and rubber industries (Mehta & Pitt 1976), crystalline silica has been found to be useful for products such as steel, ceramics and refractory bricks. Nevertheless, crystalline silica is considered to be carcinogenic, and so this may limit its uses in the future.

Both research are similar in the fact that they both make use of Rice husk as the main raw materials while they differ on the grounds that while Akeke, G., Ephraim, M.,

Akobo, I.Z.S and Ukpata, J., worked on the Structural Properties of Rice husk Ash Concrete for construction works, this study focuses on the use of Rice husk ash as a resist agent for fabric design.

Opara, (2011) in its study titled Low Cost Materials for Building and Construction: A Case Study of Rice husk. The study focused on in providing alternative cheap but quality building material for construction work from a waste product like rise husk. It was revealed from the study that the tile produced are cost effective, strong, maintenance free; resistant to corrosion, water and heat, and it is also not carcinogenic.

The two studies are similar on the ground that both studies are aimed at finding a lasting solution to the environmental pollution, degradation and hazards caused by Rice husk to our environment. Furthermore the differ on the fact that Opara, (2011) worked on the various ways of utilizing Rice husk in building industry and this study is working on the use of Rice husk in the clothing and textile industry.

Alheri (2014) carried out a research on the Development of resist decorated fabrics for fashionable clothing in some selected parts of Kaduna and Kano states Nigeria. The research identifies and assesses the decoration of fabrics for use in fashionable clothing for occasional and everyday wears. The overall objective of the study was to indentify the available types of the decorative fabrics like the tie-dye, batik and the adire-eleko as well as to examine which was the most preferred of the decorated fabrics for fashion use. The research adopted the descriptive survey method for the research design and Questionnaires, interviews, and observational schedules were used to source information from the sample population. Findings from the study shows that resist techniques of fabric decoration are source of supply in fashion business in Nigeria. The similarity between the two studies is that both are on resist decorated fabric and the difference is while Alheri work made use of the finished product (resist decorated fabric)

in the production of fashionable clothing, the present study is on the use of raw material (rice husk known to be a waste) for the production of the resist decorated fabric.

Akintayo (2013), examined the Knowledge, Attitude and Practice of using Protective Equipment By Traditional Resist Fabrics Workers In Abeokuta, Nigeria as the Resist fabric techniques such as tie- dye, batik, adire-eleko e.t.c is a manual procedure that directly exposes workers to various synthetic dyes and chemical used. The aim of this study was to assess the level of knowledge, attitude and practice on the use of personal protective equipment by traditional resist fabric workers in Abeokuta.

Cross sectional survey method was used for the study to select workers of traditional resist fabric. The workers were interviewed by face-to-face questionnaire aimed at getting firsthand information from them. The results the research revealed that the prevalence of good knowledge and appropriate attitude was low equal 3.7% and 4.2% respectively. Furthermore, the prevalence of using nose cover was 29% and most of the workers know that synthetic dyes and chemicals produces poisonous gas and can cause harmful effect to their health. Knowledge about these information was received from families, friends and neighbours while few of them receive if from radio.

Akintayo study differs from this present study as it examines the knowledge, attitude and practise of traditional workers who uses resist fabric while this research deals with the use of rice husk as resist agent for fabric decoration. Their similarities lie on the fact that both researches are centred on the resist fabric such as tie-dye, batik, adire-eleko for decoration. Furthermore, both studies proposed appropriate recommendations in other to reduce the health effect on individual and the environment.

Olowookere (2010) investigated Embroidery as an Embellishment in Fabric Decoration. Since Nigeria is endowed with abundant human, natural and material resources, which

could be used in different vocational practices, the aim of the study was to critical analysis the forms, content and significant of embroidery in art, the thread colours, fabric motifs and pattern suitable for a successful embroidery design in fabric decoration as Embroidery being an art of decorative process has played principal roles in entrepreneurship development. Practitioners have consistently practiced their art with attention to uniqueness and high quality forms, styles and content. The general conclusion is that if embroidery is properly done, it would increase the embroiderers sense of creativity in our societal growth and the interested individual should be encourage to learn the craft so that the tradition will remain forever.

Olowookere's study differs from this present study as the research made use of embroidery stitches in fabric embellishment while this research made use of rice husk which was seen as a waste in the production of resist agent for fabric embellishment. Both research have similarities as they both stuies fucos on different ways of fabric embellishment or decoration.

2.3.2 Studies on the Uses of Rice husk and its Ash

In the late 1970s, Beagle (1978) reviewed the utilization of energy from Rice husk in different countries. He reported that the husk had been traditionally utilized as an energy source within the mill itself for over a century. He further noted that the first recorded use of Rice husk as an energy source in a rice mill (in 1880) was in Burma. Beagle also mentioned that in many countries Rice husk had been used as a fuel in households. Some used it as a fuel for rice milling operations and for paddy drying. Some also used it as a fuel in brick kilns. Moreover, Beagle (1978) discussed in detail the different technologies used to convert Rice husk to energy.

One of advantageous energy uses of Rice husk is to use it as a fuel to generate electricity. He reported that two power producers (in the Philippines and Surinam) had already been using Rice husk as a fuel by then. However, he noted that the steam generated from the boiler was used only in an electricity generator and this steam was not used for any other purpose in the process. At present, the technologies for using Rice husk in power generation have evolved and Rice husk is widely employed in electricity production in many rice growing countries including Thailand. There were early attempts to use Rice husk for electricity in Malaysia as reported in Mahamud (1986), and in Indonesia (Manurung et al. 1986). More recently, The EC-ASEAN COGEN Programme (1998) conducted a study of the feasibility of using biomass (including Rice husk) to generate electricity in Thailand.

Cogeneration is the production of heat and electricity simultaneously and such heat and electricity are used at the same time. This comes from the idea that the heat generated from the boiler in power production (in the form of steam) was usually not used and wasted up to 65% of the total heat produced (Jude, 2003). To make use of this wasted heat, the cogeneration concept was established. This technology has been successfully used in rice mills in many rice growing countries such as Cambodia, Indonesia, Malaysia, Philippines, Vietnam and Thailand. The electricity generated was used within the rice mills and the surplus power was sold to customers, while the heat was used to dry the paddy rice (Bergqvist, Wardh, Das,&Ahlgren 2008; Mathias 2004; Nguyen 2005). Mehta & Pitt (1976) successfully produced heat and Rice husk ash for use as a semi-reinforcing filler for rubber and to make hydraulic acid-resisting cement by mixing the ash with lime. This was achieved by burning Rice husk in their specially designed furnace. Hamad (1981) achieved efficient Rice husk combustion while producing silica Rice husk ash.

However, in practice (on a commercial scale) the ash quality does not seem to be a concern when using Rice husk to generate power. For example, Mathias (2004) discussed the success of electricity generation from Rice husk on an industrial scale. Nevertheless, he did not discuss Rice husk ash being produced from the process of power production. This implies that the efficiency of converting Rice husk into the main product, such as electricity/heat, seems to be preferred to the option of deriving a co-product such as Rice husk ash. More recently, Bergqvist et al. (2008) assessed the technical and financial feasibility of Rice husk based power generation in Vietnam taking into account the ash produced from the electricity generation process. They argued that the ash market is less stable than the electricity market. Therefore, selling electricity seems to be a more reliable income source. In addition, they commented that the ash quality can only be controlled by modern combustion technologies, which may not be used by small and medium-size Rice husk power producers. This would make it difficult for them to negotiate with the Rice husk ash market as it is hard to produce ash with consistent quality. The use of energy from Rice husk in the form of briquettes was also discovered long ago. Beagle (1978) mentioned that there were attempts in Switzerland, Japan and India to develop machines to produce Rice husk briquettes for sale. At present, Rice husk briquettes still appear to be used in many countries, including Thailand, with a much improved production technology. For example, Toan, Cuong,& Leon. (2005) developed a highly efficient briquetting production system in Vietnam, with a reduction of 25 percent in electricity consumption and less CO emission compared with the traditional production process. In Bangladesh, the surplus Rice husk from using it as a fuel in rice mills was turned into briquettes for use in small restaurants and poor households (Ahiduzzaman 2007).

Rice husk has also been used as a fuel in cement manufacturing to substitute for fossil fuels. Murray & Price (2008) reported that the use of biomass (including Rice husk) as a substitute fuel for fossil fuel in cement kilns had been widely used in countries like India, Malaysia and Thailand. Moreover, they stated that Rice husk can possibly replace up to 35 percent of the total energy demand in such kilns. In Thailand, the Thailand Environment Institute (TEI) reported that Rice husk was also used as a substitute fuel for fossil fuels in cement manufacturing. However, the substitution rate of Rice husk was not mentioned in their report.

Rice husk can be converted into liquid fuel such as cellulosic ethanol. Being rich in celluloses, hemicelluloses and lignin, Rice husk can be used as a feedstock for cellulosic ethanol production. There were attempts to develop techniques of converting Rice husk into ethanol, as presented in (Saha & Cotta 2007, 2008; Saha &Cotta. 2005) .In addition, there was research attempting to produce bio-oil from the pyrolysis of Rice husk, as presented in Williams & Nugranad (2000) and Ji-lu (2007). It was found that this oil could be used as a fuel oil in boilers or furnaces without any machine upgrading required. Moreover, Ji-lu (2007) argued that it is possible to emulsify bio-oil with diesel to use in diesel engines, and that bio-oil could also be refined for use as a vehicle fuel. Nevertheless, the use of bio-oil from pyrolysis in engines has not yet been developed and implemented on commercial scale. Stucley (2006) pointed out that one of the weaknesses of pyrolysis oil is that it cannot yet be used in engines commercially, while this capacity is the strength of ethanol, is that it can be blended with gasoline, producing gasohol to use in cars directly without any engine modification. However, it should be noted that although the conversion of Rice husk into these liquid fuels seems possible, the technologies are currently in the developmental stages.

2.4 Summary of Reviewed Literatures

Literature reviewed for this study showed that most studies have been conducted with rice husk and its ash, using this waste product to produce cement, concrete, pillows etc. It was also discovered from the reviewed that other studies dwelt on rice husk in the production of tooth paste making, pillow stuffing, fire work coating, juice extractions, paper production etc, It has been proven from the literature reviewed that rice husk ash has the special feature which makes it useful in steel, thermal insulator, refractory brick and ceramic production, also the study found out that rice husk can be used as an oil absorbent. The study confirmed the fact that rice husk and its ash could be used in many ways, although most of these research work were conducted outside Nigeria but despite the fact that there are numerous studies on the use of rice husk and its ash, no research has been conducted on the use of rice husk as resist agent for fabric decoration both within and outside the Nigeria. The present study was undertaking to assess rice husk as a resist agent in teaching and learning of fabric decoration in Colleges of Education in Niger State in terms of production of the resist agent from the rice husk, suitability of the rice husk as a resist agent, acceptability of the fabrics produced from rice husk resist agent and a comparative study of rice husk with cassava resist agent which most studies did not considered. These are the gaps the study filled.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter focuses on the methodology and procedures applied in collecting and treatment of data in order to achieve the objectives of this research study. The chapter comprises of:

3.1 Research design

3.5 Population of the study

3.6 Sample size and sampling procedure

3.7 Instrument for data collection

3.4.1 Pilot study

3.4.2 Validity of the instrument

3.4.3 Reliability of the instrument

3.5 Procedure for data collection

3.6 Procedure for data analysis

3.1 Research design

Design can be described as an outline, a general arrangement or plan from which something may be made. According to Nworgu (1991) a research design is a plan or blue print which specifies how data relating to a given problem should be collected and analysed, it provides the procedural outline for the conduct of any given investigation. The research design used for this study is true experimental, this is because the study is purely an experimental work aimed at finding out is rice husk can be used as a resist agent for fabric decoration. The design became relevance in that the researcher conducted the experiment with the subjects after which questionnaire items were administered to the respondents. Akuezuilo and Agu (2003) states that experimental research attempts to answer the question if this is done under careful controlled conditions, what will happen?

To answer this question, the researcher systematically manipulated certain influences or variables and then observe how the specimen of the study is affected or changed. The study interest was on the assessment of rice husk as resist agent for fabric decoration. The researcher prepared the resist agent by mixing Carboxymethyl cellulose (CMC) or cellulose gum with water, after which the rice husk was added and the resist agent was formed. The rice husk resist agent was applied on the surface of a white brocade fabrics with stencil and splash techniques and allowed to dry. After drying, the cold water dyeing process was used and the resist agent was washed off, exposing the areas resisted which gave effects or patterns to the fabric (textile design).This implies that variable was controlled in such a way that the effects observed attributed to the variable manipulated, it was of great necessity to adapt this method of research so as to have purposeful and practical information on the outcome of the study.

3.2 Population of the study

The population of the study is eighty (80) comprising of all the NCE I and II students of Home Economics Departments together with the clothing and textile lecturers in the two Colleges of Education in Niger State (Federal College of Education Kontagora and College of Education Minna). The detail is presented in Table 3.1

Table 3.1: Population of the Study

Colleges of Education	Students		
	NCE I	NCE II	LECTURERS
FCE, Kontagora	20	15	2
COE, Minna	17	23	3
Total	37	38	5

Source: Heads of the Departments of Home Economics: Federal College of Education, Kontagora and College of Education Minna Niger State (2014)

3.3 Sample Size and Sampling Procedure

The sample size of thirty five (35) was used. This is in line with the recommendation of Denga (2002) who suggested a sample size of thirty (30) subjects in an experimental research design. A purposive sampling technique was used to select fifteen (15) students from each of the colleges and all the five (5) lecturers handling clothing and textile courses who are judged to suit the purpose since it is an experimental work and as such small numbered is needed to achieve good result. the seletion was based on NCE I and II, with the exclusion of NCE III from the two colleges because the NCE III students are likely not to be engaged in Teaching practice and Student Industrial Work Experience Scheme that takes them out of the College.

Table 3.2 sample size

Colleges of Education	Students		
	NCE I	NCE II	Lecturers
FCE, Kontagora	10	5	2
COE, Minna	6	9	3
Total	16	14	5

Source: Field survey, 2016

3.4 Instrument for Data Collection

A researchers developed instrument titled Assessment on Rice Husk as a Resist Agent for Fabric Decoration in Teaching and Learning of Textile Design (RHRAFDTLTD). The questionnaire was developed based on a modified four point rating scale with weights of Strongly Agreed (4), Agreed (3), Disagreed (2) and Strongly Disagreed (1). It comprises of three parts A, B and C; part A provides information on the demographic characteristics of the respondents, part B was based on the focus of the study, while part C is on researcher's assessment on the students' performance on the practical conducted in fabric dyeing with rice husk resist agent.

3.4.1 Validity of the Instrument

In order to make sure that the final copy of the test instrument is valid for the study two methods were employed; these are vetting and pilot study.

Vetting: the self structured questionnaire was validated by the supervisors of this research work and one (1) expert in the department of test and measurement, Ahmadu Bello University, Zaria.

Pilot study: Pilot study was carried out to determine the reliability of the instrument. A total number of fifteen (15) students was used for the pilot study comprising of NCE I

and II students of Home Economics in The Federal Capital Territory College of Education Zuba, Abuja. This is because it has similar characteristics with the case study area. The students participated actively starting from the production of the Rice husk as resist agent and the application of the resist agent on the fabric for decoration and the dyeing of the fabrics. Though these fabrics were prewashed by the researcher to keep it clean from any factory treatment, this treatment allow the dye to penetrate well and to ease the work. The students and Lecturers were taught on how to produce the rice husk resist agent, and this resist agent was applied on the surface of the fabric following the patterns drawn, after which the fabric was allowed to dry and then dyed and washed. The students and the lecturers were given the questionnaire to fill, and the data collected from the experiment were analyzed by a statistician using the Cronbach's alpha reliability coefficient.

3.4.2 Reliability of the Instrument

The data collected from the pilot study were statistically analysed for the purpose of confirmation of the reliability co-efficient. Cronbach's alpha reliability co-efficient method was used to analyse the data collected. Reliability co-efficient of alpha level of 0.87 was obtained. This reliability co-efficient is considered adequate for the internal consistency of the instruments. This is in agreement with Spiegel and Stevens (1999) who stated that an instrument is considered reliable if it lies between 0 and 1, and the closer the reliability co-efficient is to zero, the less reliable is the instrument, and the closer the reliability co-efficient is to one, the more reliable is the instrument, this therefore confirms the reliability of the instrument used for this study as fit for the work.

3.5 Procedure for Data Collection

The researcher obtained a letter of introduction from the Head of the Department of Vocational and Technical Education, Ahmadu Bello University Zaria for permission

for the Heads of Department of Home Economics, FCT College of Education Zuba, Abuja, Federal College of Education Kontagora and College of Education Minna both in Niger State Nigeria. The purpose being for effective access and smooth conduct of the practical work with the students and the lecturers of these Departments. The data for this study were collected in stages:

Stage I: Collection of the material:

- Rice husk: This was obtained from a milling factory very close to the researcher's residence at Kontagora Local Government Area of Niger State and is displayed on Figure.3.5.1



Rice husk



Rice husk gotten after the rice milling process.

Fig.3.5.1: Rice husk

- Carboxymethyl cellulose (CMC) or cellulose gum also known as antisol a whitish powdered environmental free chemical made of wood pulp and cotton linters and other sources. This was gotten from chemical shop at Sabo-Gari Market in Zaria, is available at almost all the chemical shop and at affordable price. It is one of the chemical used in liquid soap making.

Fabric to dye: The fabrics were gotten from Kwori market in Kano. The researcher used observation method to identify cotton fabric (white brocade). This fabric was used to get better results since cold water dyeing method was used. Also vat dyes are used on cellulosic fibres and are very much available in different colours and sold in our local shops in Nigeria. The fabrics was pre-washed and dried before the dyeing processes took place, this was to remove all the chemical treatment given to the fabrics in other to allow dyes to penetrate properly.

Sodium hydrosulphite, sodium hydroxide: These are the dye fixer. All these were gotten from chemical shop at Sabo-gari market in Zaria.

The following were purchased from Sabo-Gari Market at Zaria: Vat dyes of different colours, Rubber gloves, Plastic containers, Plastic buckets, Measuring cups and spoons, Stirring spoon or stick.

Pencil: for drawing different patterns or shapes on the fabric.

Stencil: A hard cardboard paper with cuts of different shapes or patterns

Water (solvent) from college taps

Stage II: Material and Equipment

The following are the material and equipment that was used for this:

Antisol: This is a whitish powdered environmental free chemical also known as Carboxymethyl cellulose (CMC) or cellulose gum, is a cellulose derivative with carboxymethyl groups (-CH_2-COOH) bound to some of the hydroxyl groups of the glucopyranose monomers that make up the cellulose backbone. It is often used as its sodium salt, sodium carboxymethyl cellulose. It is also being used in the preparation of liquid soap. CMC is used in food under the E number E466 as a viscosity modifier or thickener, and to stabilize emulsions in various products including ice cream. It is also a

constituent of many non-food products, such as toothpaste, laxatives, diet pills, water-based paints, detergents, textile sizing, and various paper products. It is used primarily because it has high viscosity, is nontoxic, and is generally considered to be hypoallergenic as the major source fibre is either softwood pulp or cotton linter.

Rice husk, Fabric to dye, Sodium hydrosulphite, sodium hydroxide, Dye, Rubber gloves, Stencil different motifs drawn on a hard cardboard paper, Plastic containers, Plastic buckets, Measuring cups and spoons, Stirring spoon or stick , camera and Participant observation,

Stage III: Measurements and procedure for making of the rice husk resist agent:

Materials	**Measurement**
Antisol (Carboxymethyl cellulose (CMC) or cellulose gum,)	Four (4) table spoons full
Water	2.5 litres
Rice husk	twelve (12) milk tins

After measuring the water into the bowl, the antisol was measured and poured gradually into the water stirring simultaneously. The antisol was allowed to soak in water for thirty (30) minutes to allow it swell, though stirred while still standing. Then the Rice husk was measured and added into the paste and stirred smoothly until a smooth paste was gotten. This process is displayed in figures 3.5.2, 3.5.3, 3.5.4 and 3.5.5 respectively.



Fig.3.5.2: Antisol or CMC being mixed with water in a bowl.



Fig. 3.5.3: The soaked (Antisol) CMC ready to be mixed with rice husk



Fig.3.5.4: Rice husk being measured into the antisol mixture





Fig.3.5.5 addition of rice husk into mixture of antisol & water to form the rice husk resist agent.

Measurements and procedure for making of the cassava resist agent:

Materials	**Measurement**
Water	2.5 litres
Cassava flour	Two (2) levelled milk tin

The water was poured into a clean pot and the cassava flour was measured and poured into it and stirred well, it was then placed over a low heat stove and allowed to cook while being stirred constantly to avoid lumps. The cooked starch was removed after it thickened (pap consistency), and was allowed to cool a little before being applied on the surface of the fabric. Both the stencil and splash techniques were used to obtain different patterns. In the comparison stage of this work, equal quantity of the fabrics were cut out and spread out, the two resist agent was applied on the surfaces of each fabric with different techniques (splashing and stencil) and allowed to dry under the sun. This procedure is shown in figures 3.5.6, 3.5.7 and 3.5.8.



Fig.3.5.6: Cassava and rice husk resist agents applied on the equal quantity of fabrics and left to dry.



Fig.3.5.7: Cassava and rice husk resist agents applied with different techniques of resist method and left to dry.



Fig. 3.5.8: Rice husk resist agent applied on the surface of the fabric with object created technique (the blue bowl).

Stage IV: Procedure for the application of the rice husk and cassava resist agents:

Fabric to dye: The researcher pre-washed and dried all fabrics before the commencement of the practical. This is to remove any factory treatment or finishes that was given to the fabrics in order to allow the dye to penetrate easily without any utterances and also to hasten the processes.

When the fabric was dried, it was spread out and a stencil was used (a hard card board paper with different motifs drawn and cut out) to obtain different patterns (Stencil techniques), the use of shapes of object to draw out different pattern is allowed. Broom was also used to splash the rice husk and cassava resist agents on the surfaces of fabrics (Splashing technique).The resist agent was applied with hand or spoon systematically at the places where the patterns are desired to appear and allowed to dry for minutes or hours depending on the intensity of the sun. Possible reasons to know when the rice husk is dry, is that the watery look of the resist agents on the surfaces of the fabric will trun to dry look showing clear brown colour of the rice husk and the areas where the resist agent

was applied will be bounded so well on the fabric making it impossible for fingers to peel of the resist agent from the surface of the fabric. The step by step techniques and procedures are shown in the figures 3.5.9, 3.5.10, 3.5.11, 3.5.12, and 3.5.13.



Fig.3.5.9: Application of rice husk resist agent with splashing technique



Fig.3.5.10: Application of rice husk resist agent with stencil technique.



Fig 3.5.11 Application of rice husk resist agent with stencil technique.

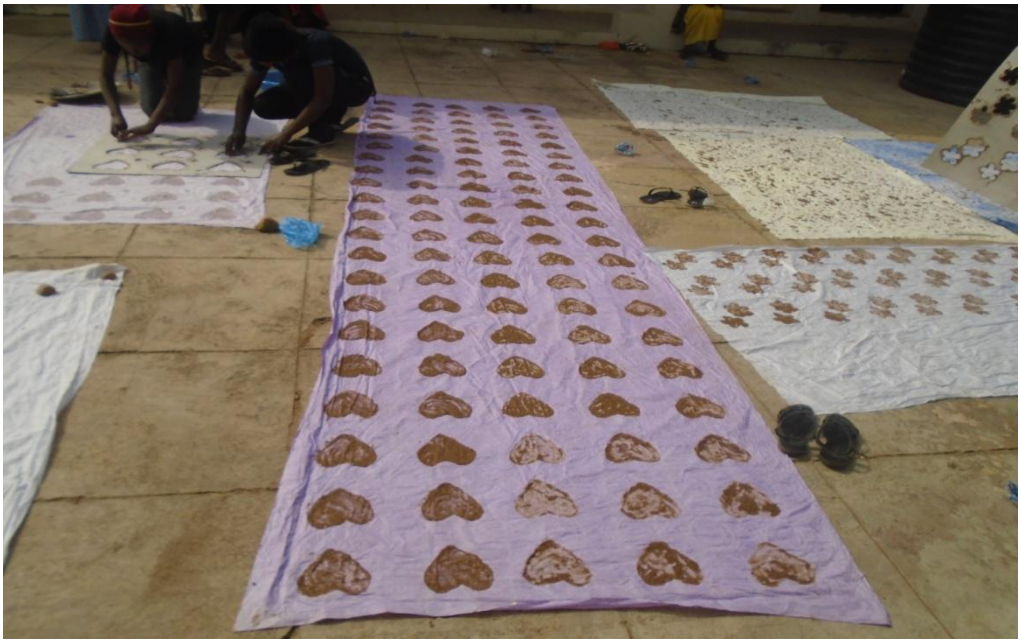


Fig.3.5.12: Rice husk resist techniques applied on the surfaces of fabrics and left to dry in the sun.



17

Fig.3.5.13 Rice husk resist agent applied on the surface of the fabric using object shape technique.

Stage V: Procedure for the preparation of the dye and the dyeing:

Then after drying, the dye was prepared as follows:

4 tablespoons of Sodium hydrosulphite,

3 table spoons of sodium hydroxide

4 table spoons of vat dye

4 litres of water (cold water)

All these measurement are poured in the plastic bowl and the measured cold water was added and stirred thoroughly. The fabric was dipped into each different colour of vat dyes bowls and allowed to stand for three to five minutes, depending on the intensity of the colour desired. They were turned so as to have even colours after dyeing. This measurement was used on each piece of fabric dyed since cold were dyeing was used. The practical work is displayed in figure 3.5.14 to 3.5.20



Fig.3.5.14 : Fabric dyeing process.



Fig.3.5.15: Dyed, re-patterned and dyed fabrics with rice husk resist agent.



Fig.3.5.16: Dyeing of the dried rice husk resisted patterned fabrics.



Fig.3.5.17: Dyed fabrics patterned with rice husk resist agent.



Fig.3.5.18: Dyeing process of splashed technique with rice husk resist agent.



Fig.3.5.19: Dyeing of fabrics designed with rice husk and cassava resist agent into a bowl.



Fig.3.5.20 Dyed fabrics designed with rice husk and cassava resist agent.

3.6 Procedure for data analysis

The data obtained for this study were subjected to statistical analysis using percentages and frequencies for the bio data of the respondents and descriptive analysis that is mean and standard deviation was used in answering the research questions raised for the study. The performance of the students were analysed by giving them practical to conduct using four yard of brocade fabrics cut in two equal pieces and each is to be patterned with rice husk resist agent and cassava resist agent respectively, and afterwards dyed in different colours, later starched and ironed and package for submission with written procedures on the practical conducted. The submitted work were be graded by the researcher.

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF DATA

This chapter presents the analysis of the bio data of the respondents using descriptive statistics (mean and standard deviation). The data presentation and analysis are presented under the following sub-headings:

4.1 Analysis of bio data of the respondents

4.2 Answers to research questions

4.3 Summary of Major the Finding

4.4 Discussion of Results

4.1 Analysis of bio data of the respondents

The analysis of the respondent bio data are presented in table 4.1 to 4.3

Table 4.1: Percentage of respondents by gender

Gender	No. of respondents	Percentage of respondents
Female	32	100

Source: Field study 2016

Table 41: Shows that with 32 respondents sampled for the study, hundred percent (100%) of the total respondents were female.

Table 4.2: Percentage of respondents by age

AGE	No. of respondents	Percentage of respondents (%)
17-25 years	25	78.13
26-35 years	6	18.75
36-45 years	1	3.13
46-55 years	-	-
Total	32	100

Source: Field study 2016

Table 4.2: It can be discerned from Table 4.2 that out of the total respondent sampled for the study. Those that fall between the age brackets of 17-25 years were 25 (78.13%), those between the age range of 26-35 years are 6 (18.75%), respondents that falls in the category of 35-45 were 1 (3.13%) while those within the age bracket of 46-55years were 0 (0%).

Table 4.3: Percentage of respondents by class level

Class level	No. of respondents	Percentage of respondents (%)
NCE I	16	50
NCE II	13	40.63
Lecturers	3	9.38
Total	32	100

Source: Field survey, 2016

Table 4.3: It is obvious from table 4.3 that with 16 respondents who belongs to the category of NCE I are 16 (50%) those that belong to the category of NCE II were 13 (40.63%) while lecturers were 3 in the sample are (9.38%)

Table 4.4: Percentage of respondents by Institution

Institutional type	No. of respondents	Percentage of respondents (%)
Federal College of Education Kontagora	20	62.5
College of Education Minna	12	37.5
Total	32	100

Source: Field survey, 2016

Table 4.4: It can be inferred from table 4.4 that with institutional type. Federal College of Education Kontagora has 20 respondents with a percentage of (62.5), while College of Education Minna has 12 subjects with a cumulative percentage of 37.5 respectively.

4.2 Answers to Research Questions

Table 4.5: Research question one

What is the acceptability level of fabrics dyed with rice husk resist agent? (N=32).

S/N	Acceptability of Fabric Produced From Rice Husk Resist Agent	**SA 4**	**A 3**	**D 2**	**SD 1**	**Total**	$\overline{X}$	DECISION
1	Rice husk as resist agent does not affect the texture of the fabric	128	0	0	0	32	4.0000	Agree
2	Rice husk resist agent is adherence on cotton fabric	112	12	0	0	32	3.8468	Agree
3	The patterns created from rice husk is sharp and precise	52	45	0	0	32	3.9355	Agree
4	The fabric produced from rice husk resist agent is attractive and marketable.	116	9	0	0	32	3.9280	Agree
5	Rice husk resist agent give much crackles to the fabrics	2	0	18	100	32	2.5484	Disagree
6	One can deduce that rice husk was used in the fabric as a result of particles left after production	0	0	0	128	32	1.0000	Disagree
7	The fabric produced from rice husk resist agent is as good as other fabrics produced from other resist agent	36	60	2	0	32	4.000	Agree

Source: Field survey, 2016

Table 4.5 indicates the opinions of the respondents on the acceptability of fabric produced from rice husk resist agent. The response pattern to item number 1, 2, 3, 4, 5

and 7 got the highest mean scores as rice husk as resist agent does not affect the texture of the fabric ($\dot{X}$=4.0000), rice husk resist agent is adherence on cotton fabric (X=3.8468), the fabric produced from rice husk resist agent is attractive and marketable (X=3.9280), the patterns created from rice husk is sharp and precise (X=3.9355), rice husk resist agent give much crackles to the fabrics (X=2.5484), fabric produced from rice husk resist agent is as good as other fabrics produced from other resist agent (X=4.000), while item number 6 shows the mean rating of 1.0000 , one can deduce that rice husk was used in the fabric as a result of particles left after production which was found to be less than the bench mark of (2.50) stands for disagree, this implies that rice husk resist agent can be washed away completely from the fabric after application.

Table 4.6: Research question two

How are the fabric dyed with rice husk and cassava resist agent rated? (N=32).

S/N	Item	Resist agents	Excellent 4	Good 3	Fair 2	Poor 1	Total 6	$\bar{X}$	Decision
8	Ease of penetration of dye through the resist agent	Rice husk agent	2	0	0	120	32	1.0323	Poor
		Cassava agent	5	0	0	69	32	1.8306	Poor
9	Ability of the agent to resist the dye in covered area	Rice husk agent	108	12	0	1	32	3.7823	Excellent
		Cassava agent	69	8	0	0	32	2.4194	Good
10	Colour intensity of the fabric after dyeing	Rice husk agent	104	12	4	0	32	3.7097	Excellent
		Cassava agent	86	12	4	1	32	3.1210	Excellent
11	Texture of fabric after dyeing	Rice husk agent	104	12	2	0	32	3.6774	Excellent

		Cassava agent	96	34	0	0	32	3.7742	Excellent
12	Attractiveness of fabric after dyeing	Rice husk agent	120	6	0	0	32	3.9677	Excellent
		Cassava agent	96	15	9	0	32	3.6048	Excellent
13	Cost efficiency	Rice husk agent	96	6	10	1	32	3.4113	Excellent
		Cassava agent	8	18	42	3	32	1.6855	poor

Source: Field survey, 2016

Table 4.6 showed the responses on difference between rice husk and cassava resist agent. The response pattern to item number 8 which states that there is high rate of dye absorption through the resist agent got the lowest mean score 1.0323 and 1.8306 which indicated a poor level of dye absorption through the two resist agents, which indicated that the two resist agents has the ability to resist dye absorption. The response pattern on the adequacy of rate of resistance, rice husk has a means score of 3.7823 which indicated an excellent result while cassava agent has a mean score of 2.4194 which indicated a good result. For colour intensity of the fabric after dying, rice husk agent has a mean score of 3.7097 while cassava agent also has a mean score of 3.1210 this indicated that both have excellent result which implies that both specimen have good colour intensity after dyeing. Texture of the fabric after dying has a mean of 3.6774 for rice husk and cassava paste has a mean of 3.7742 which indicate an excellent result. Attractiveness of fabric after dying indicated that rice husk has a mean of 3.9677, while cassava agent has a mean of 3.6048 which indicated an excellent result for both. For cost efficiency of the resist agents, rice husk has a mean of 3.4113 which indicate an excellent result, while cassava agent has a mean of 1.6855 which show a poor result. This implies that the production of rice husk resist agent is cheaper when compared to cassava resist agent.

Research question three

Table 4.7: Research question three

What is the performance levels of students taught fabric dyeing with rice husk resist agent? (N=32).

S/N	Performance levels of students taught fabric dyeing with rice husk resist agent.	Excellent 4	Good 3	Fair 2	Poor 1	Total	$\bar{X}$	Decision
14	I actually understood the practical conducted with fabric dying.	60	40	28	0	32	2.42	Good
15	The entire practical conducted were of waste of time to me.	0	12	0	32	112	2.00	poor
16	The procedures used were simple and easy for me to comprehend.	52	45	0	0	32	3.93	Excellent
17	I can comfortably produce fabric dye with rice husk resist agent	116	9	0	0	32	3.92	Excellent
18	Attractiveness and neatness of fabric after dyeing (starching and ironing)	100	18	2	0	32	2.54	Excellent
19	I sustain my academic with fabric dying after the practical conducted.	90	8	12	8	32	2.56	Good
20	I can hardly perform fabric dying using rice husk resist agent after the experiment	2	37	59	0	32	1.69	Poor

Source: Field survey, 2016

Table 4.7 indicates the opinions of the respondents on the performance levels of students taught fabric dyeing with rice husk resist agent? The response pattern to item number , 14, 16, 17, 18 and 19 got the highest mean scores as statement on understanding the practical conducted with fabric dying (X=2.42), The procedures used were simple and easy for me to comprehend (X=3.93), I can comfortably produce fabric dye with rice

husk resist agent. (X=3.92), Attractiveness and neatness of fabric after dyeing (starching and ironing) (X=2.54), I sustain my academic with fabric dying after the practical conducted. (X=2.56), while item number 15 and 20 shows the mean rating of 2.00 and 1.69 that is the entire practical conducted were of waste of time to me and I can hardly perform fabric dying using rice husk resist agent after the experiment which was found to be less than the bench mark of (2.50) stands for poor. This implies that the performance levels of students taught fabric dyeing with rice husk resist agent was encouraging and satisfactory.

4.3 Summary of major findings

From the result of the analysis presented, the major findings of this study are summarized thus:

1. The resist agent for fabric decoration was produced from rice husk through the addition of antisol (CMC) which serves as a binder and water to the husk .The production exercise was demonstrated to the respondents in form of teaching and learning exercise.
2. The rice husk resist agent is adherence to the cotton fabric.
3. Rice husk resist agent is applicable to cold water dyeing only.
4. Rice husk is a suitable resist agent for effective teaching and learning of fabric decoration.
5. Rice husk resist agent allows the use of various techniques of resist such as splashing, use of stencil, and drawing.
6. Fabrics designs made from rice husk resist agent are acceptable.

7. There is no clear difference on the comparison of rice husk resist agent and cassava resist agent as both resist agents yielded the same result by serving as suitable resist agent. Furthermore, both resist agents possessed the characteristics of paste resist that is giving a clear difference between the right and the wrong side of the fabric after dyeing.

Based on the finding above, it is concluded that Rice husk resist agent is an alternative and effective teaching aid in the teaching and learning of resist dyeing in Colleges of Education.

4.4 Discussions

This study focused on the assessment of rice husk as resist agent for fabric decoration in teaching and learning of textile design in Colleges of Education in Niger state Nigeria. In line with this, the data collected were used to analyse the four research questions using descriptive (percentages, frequencies and mean). The section presents the discussion of findings:

4.4.1 Resist agent produced from rice husk can be used the teaching and learning of fabric decoration.

The literature reviewed has shown that rice husk has been used in cement and concrete making, feeding of livestock although in using it, it requires adding it with other high nutritional animal feeds like bean, soya beans, maize and wheat etc to improve it nutritional quality. To the best knowledge of the researcher, no studies have attempted to use rice husk as resist agent for textile decoration. Rice husk on its own cannot serve as a resist agent, but with the knowledge of the researcher as a liquid soap maker she observed that antisol (CMC) a chemical used in the production of liquid soap can serve as a binding agent to the rice husk and as such helps in the production of rice husk resist agent. The production was easy, simple and fast as antisol (CMC) was mixed with water

and allowed to soak for 30 minutes after which rice husk was added and stirred, and the resist agent was formed. The present findings is in consonance with Otto, et al,(2008) whose findings revealed that rice husk if burnt produces ash containing amorphous reactive silica and when mixed with lime and ground to a very fine powder give a good quality of cement that can be used for plastering and sealing of cracks in civil structures. Also, Muthadhi, Anitha and Kothandaraman (2007) findings revealed that rice husk if burnt generates a good quality of pozzolanio ash containing silica which can be used in the production of Portland cement. The present finding is in harmony with that of (Bronzeoak 2003) Karim, Zain, Jamil, Lai and Islam (2012) whose finding also showed that rice husk ash in cement or in concrete not only fulfils the demand of cement but also plays a role in production of durable concrete.

4.4.2 Suitability rate of rice husk as a resist agent for effective teaching and learning of fabric decoration

The literature reviewed show that rice husk has been used as a suitable agent for the filling of lands, tooth paste making, bursting charge for coating of gun powder, cement making, bio fuel, etc. From this study, it was found that rice husk has been a suitable resist agent in the fabric decoration which makes it adequate teaching aid in the production of textile design. This is because it bonded so well on the surface of the fabric and resisted dye penetration through it, also it allowed the use of other resist techniques such as splashing, drawing and use of stencil. The present findings is in harmony with that of Beagle (1978) whose finding revealed that rice husk had been traditionally utilized as an energy source within the mill itself for over a century. The researcher further noted that the first recorded use of rice husk as an energy source in a rice mill (in 1880) was in Burma. Moreover, Beagle (1978) discussed in detail the different technologies used to convert Rice husk to energy. One of advantageous energy uses of Rice husk is to use it as

a fuel to generate electricity which was sold to customers, while the heat was used to dry the paddy rice.

4.4.3 The acceptability of fabric produced from rice husk as a resist agent

Ajiwe (2000), successfully produced white Portland cement using Rice husk as a raw material in the process of production (with the same standard as commercial white Portland cement) and this cement is sold at affordable prices, meeting the need of consumers. The study also revealed that rice husk ash can be successfully used to make low cost building blocks by mixing it with lime and/or cement and aggregates, which is locally available to substitute for cement. This cement is believed to make affordable building blocks and cements with similar standard to the conventional masonry used in rural areas, the study is in consonance with present study, because the fabric designs gotten using rice husk resist agent are beautiful with sharp and attractive patterns, also the rice husk did not affect the texture of the fabric as one cannot deduce from the end product if rice husk resist agent was used. Rice husk is available at low and no cost in almost all milling centres in Kontagora Local Government Area of Niger State and the binding agent is equally available at most chemical shops. This makes the raw material easily available at all times, and invariably making the end product that is the fabrics produced from this raw material cheap and affordable for the end users.

Implication of study to knowledge advantage:

This thesis titled Assessment of rice husk as resist agent for fabric decoration in teaching and learning of textile design in College of Education in Niger State, Nigeria.

The study has shown that rice husk which was seen to be waste in our community today serves as a suitable resist agent that can be use in fabric embellishment

Also alternative resist agent has been made available to all students, teachers and lecturers of Home Economics departments and all those into resist dyeing business for effective teaching and learning of fabric decoration on resist dyeing techniques.

The study has also contributed immensely by letting the readers know that rice husk resist agent is only adherence to cold water dyeing.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

The end point of any study is very indispensible than the beginning, thus, a summary of the relevant points and findings revealed by the study, the informed conclusions and beneficial recommendations are important elements that should convey the relevant material derived from the study to promote discussion on effective teaching and learning of Textile design. This chapter was carried out under the following sub-headings

1. Summary of the study
2. Conclusion
3. Recommendations
4. Suggestions for further study

5.1 Summary of the Study

The study aimed at carrying an examination on rice husk as a resist agent for fabric decoration in teaching and learning of textile design in Colleges of Education in Niger State, Nigeria. In line with this study, four objectives, four research questions were stated. Literature and empirical studies related to the variables of the study were reviewed in order to provide better understanding and focus to the study. The study utilized one shot experimental research design, the population comprised of 80, while the sample size was 35 using purposive sampling technique. A self designed questionnaire titled (RHRAFDTLTD) comprising of two parts A and B was used as instrument for data collection. Part A seeks the information on the demographic characteristics of the respondents while part B provides information on the focus of the study. That is Assessment of rice husk as a resist agent for fabric decoration in teaching and learning of

textile design in Colleges of Education in Niger state. Nigeria. The questionnaire was a modified four point rating scale with weights of Strongly Agreed (4), Agreed (3), Disagreed (2) and Strongly Disagreed (1). A subjective evaluation was carried to get reliable responses from the research questions stated, since the subjects participated actively in the experiment that was conducted.

5.2 Conclusion

Based on the findings of the study, it can be inferred that rice husk as a resist agent can be used for fabric decoration in teaching and learning and textile design in schools, colleges and universities. Since rice is planted and processed in Nigeria, it makes the rice husk available at all times and all season. Also the production of the resist agent was simple, easy, less time consuming and cost efficient, and it gave room for the application of other techniques of resist dyeing such as splashing, stencil and sketching.

5.3 Recommendations

In view of the results of the study the following are recommended:

1. Home Economics, other textiles science departments or practitioners of textile design could use the result of the study as a resource material for teaching their students creative skills in textile design.
2. The curriculum planners in Nigeria could incorporate into their syllabus the use of rice husk resist agent for fabrics decoration so as to encourage their use in practical, as it saves cost, easy to produce and apply on the surface of fabrics with diverse techniques.
3. Non-Governmental Organizations, skill acquisition centres both public and private sectors involved in skills training and youth empowerment can engage their trainees in the production of rice husk resist agent for sustainable decoration

of fabrics. These could also be prepared and sold to the immediate consumers which invariably will serve as a means of income to them.

4. The textile industries and factories could use the results of the study as resource material for fabric decoration.
5. The rice farmers and rice millers could use the result of the findings to generate income by producing rice husk resist agent and selling to the immediate consumers.

5.4 Suggestions for further studies

Based on the findings in the study, the following suggestions are offered for future studies:

1. The study could be replicated in terms of a comparative study on rice husk resist agent and other resist agent for fabric decoration in teaching and learning of textile design with a larger sample size.
2. *Rice husk can be tried as adhesive agent in coupling and binding of other textile products or articles like shoes, bags, etc.*
3. *Further studies could be conducted on rice husk as a pillow stuffing which could be for therapeutic reasons as they may retain the shape of the head.*
4. *Another husk or hull of other grains or other waste materials can be tried as resist agent to see if it will yield the same result.*
5. *Other fabrics beside brocade can be tired to dye with vat dye using rice husk resist agent.*
6. *Other types of dyes apart from vat dye can be used on the same brocade fabric using rice husk resist agent to design.*

REFERENCES:

Ahiduzzaman, M., (2007). 'Rice husk Energy Technologies in Bangladesh', *Agricultural Engineering International: the CIGR Ejournal, IX, (1)*

Ahmed, B., Kamruzzaman, M.., Ahammed, M.Z., & Hossain, I. (2005). 'Production of high temperature refractory bricks from Rice husk ash', *J. Bangladesh Soc. Agric. Sci. Technol.*, 2 (3&4), 45-8.

Ajay, k., Kalyani M., Devendra K., & Om P., (2012*).* Properties and Industrial Applications of Rice husk, *International Journal of Emerging Technology and Advanced Engineering,2, (10),* Retrieved from *www.bioenergyconsult.com/biomass-resources-rice-industry/ on the* 12th June,2014

Ajiwe, V., Okeke, C., & Akigwe, F. (2000). A preliminary study of manufacture of cement from Rice husk ash', *Bioresource Technology, 73*, 37-9.

Al-Khalaf M. N., & Yousif H. A., (1984). Use of Rice husk Ash in Concrete, *The International Journal of Cement Composites and Lightweight Concrete, 6(4),* 241-248.

Anitha, D. (2005). Fashion and Apparel designing(Fashion and garment making). *http://bieap.gov.in/Pdf/revtheoryP65.pdf* retrieved on the 13th of june, 2014

ApeApe Shibori, bandhani, tie-dye Retrieved from *http://www.burdastyle.com/techniques/dyeing-fabric-shibori techniques* on the 12th June2014,

Asavapisit, S., & Macphee, D.E., (2007). 'Immobilization of metal-containing waste in alkali activated lime-RHA cementitious matrices', *Cement and Concrete Research, vol. 37 (5),* 776-80.

Asavapisit, S., & Piyaphanuwat, R., (2005). Survey of Biomass Power Plants in Thailand, Division of Environmental Technology, School of Energy and Materials, King Mongkut's University of Technology Thonburi, Survey.

Batik Guild Report Retrieved from http://www.batikguild.org.uk/historyAfrica.asp accessed on the 6th March, 2015

Barkakati, P., Bordoloi, D., & Borthakur, P.C., (1994). 'Paddy husk as raw material and fuel for making portland cement', *Cement and Concrete Research, 24 (4),* 613-20.

Beagle, E.C., (1978). *Rice husk, conversion to energy* FAO agricultural services bulletin; 31, Food and Agriculture Organization of the United Nations, Rome.

Belfer, N. (1977). *Designing in batik and tie dye*. Worcester, MA: Davis Publications.

Bergqvist, M.M., Wardh, K.S., Das, A., & Ahlgren, E.O., (2008). 'A techno-economic assessment of Rice husk-based power generation in the Mekong River Delta of Vietnam', *International Journal of Energy Research, 32 (12),* 1136-50.

Bosence, S. (1985). *Hand Block Printing & Resist Dyeing*. New York: Arco Publishing Inc. bran. IV. Egg production of hens on diets with defatted Australian rice bran. Anim. Feed Sci. Technol., 27: 259-268.

Bronzeoak Ltd (2003). *Report of the Rice husk ash market study*, Bronzeoak Ltd, UK, pp: 62.

Camila, J. (2012). Surface and Parttern Design. *http://noaleco.com/blog/what-is-fabric decoration/*

Chapman, C. (2010). Colour theory for designing part 1 *International Journal of Engineering Science and Technology (IJEST), 2 (3),* 788-796. Retrievd from. *http://www.smashingmagazine.com/2010/01/28/colour-theory-for-designers-part-1-the-meaning-of-colour/ Characteristics of Treated Marine Clay for Foundation Soil Beds"* on the 12th June, 2014.

Chareonpanich, M., Namto, T., Kongkachuichay, P., & Limtrakul, J., (2004). 'Synthesis of ZSM-5 zeolite from lignite fly ash and Rice husk ash', Fuel Processing Technology, 85 (15), 1623-34. Chemical composition. Anim. Feed Sci. Technol., 27: 219-228.

Chumee J., (2008). "Characterization of platinum–iron catalysts supported on MCM-41 synthesized with Rice husk silica and their performance for phenol hydroxylation" Sci. Technol. Adv. Mater. 9 015006

Cook, D.J., Pama, R.P., & Paul, B.K., (1977). 'Rice husk ash-lime-cement mixes for use in masonry units', *Building and Environment, 12 (4),* 281-8.

Costa, H.M., Ramos, V.D., Visconte, L.L.Y., & Furtado, C.R.G., (2006). 'Design and analysis of single-factor experiments: Analysis of variance of the effect of Rice husk ash and commercial fillers in NR compounds ', *Polymer Bulletin, 58 (3), 597-610.*

Daifullah, A.A.M., Girgis, B.S., & Gad, H.M.H., (2004). 'A study of the factors affecting the removal of humic acid by activated carbon prepared from biomass material', *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 235 (1-3), 1-10.

Denga, D. J. (2002) *Educational and social Pyschology for schools and other social organisation in Nigeria:* Calabar CATS Publishing company.p101.

Dunsmore, P. (1996). The history of batik design

Dye. (2008). *Encyclopædia Britannica.* Retrieved March 26, 2008, from Encyclopædia Britannica Online: http://www.britannica.com/eb/article-9108379

El-Dakroury, A., & Gasser, M.S., (2008). 'Rice husk ash (RHA) as cement admixture for immobilization of liquid radioactive waste at different temperatures', *Journal of Nuclear Materials, 381, (3),*271-7.

Eric, R. (2015). Textile/fabric decoration https://www.fitnyc.edu/2813.asp Federal Ministry of Education: Craft Manual on Beading and Textile Design for Art and Craft

Garfield, S. (2001). Mauve: How one man invented a colour that changed the world. New York: W.W. Norton & Co.

Gonçalves, M.R.F., & Bergmann, C.P., (2007). 'Thermal insulators made with Rice husk ashes: Production and correlation between properties and microstructure', *Construction and Building Materials, 21 (12),* 2059-65.

"Growstones ideal alternative to perlite, parboiled rice hulls". *http://esciencenews.com.* 2011-12-04. Retrieved 6th June,2014

Grover, P.D., and Mishra, S.K., (1996).“Biomass Briquetting; Technology and Practices”, FAO of the UN, Bangkok.

Ishak, Z.A.M., Bakar, A.A., Ishiaku, U.S., Hashim, A.S., & Azahari, B., (1997). 'An investigation of the potential of Rice husk ash as a filler for epoxidized natural rubber--II. Fatigue behaviour', *European Polymer Journal, 33, (1),* 73-9.

Jain, A., Rajeswara Rao, T., Sambi, S.S., & Grover, P.D., (1994). *'Energy and chemicals from Rice husk', Biomass and Bioenergy, 7, (1-6),* 285-9.

Ji-lu, Z., (2007). 'Bio-oil from fast pyrolysis of Rice husk: Yields and related properties and improvement of the pyrolysis system', *Journal of Analytical and Applied Pyrolysis, 80, (1),* 30-5.

Jude, M.J., (2003). *A* Case Study on a Rice husk Cogeneration Power Plant, Sunway Hotel.

Kapur, P.C., (1980). 'Thermal insulations from Rice husk ash, an agricultural waste', *Ceramurgia International, 6, (2),* 75-8.

Karim, Zain, Jamil, Lai & Islam (2012) influences of Rice Husk Ash on the strength of mortar and concrete.

Kerlogue, F., (2007). Batik: Design, Style, & History (Paperback) Thames and Hudson Ltd .Retrieved from *www.abebooks.co.uk/**Batik**-Design-Style-History-Paperback-Fiona/15028940676/bd* on 10th may,2016 .

Kumagai, S., Noguchi, Y., Kurimoto, Y., & Takeda, K., (2007). 'Oil adsorbent produced by the carbonization of Rice husks', *Waste Management, 27, (4),* 554-61.

Kurama, S., & Kurama, H. (2008). 'The reaction kinetics of Rice husk based cordierite ceramics', *Ceramics International, 34, (2),* 269-72.

Lee M.Y., Knight D., & Kim Y.K., (2008). Brand analysis of a US global brand in comparison with domestic brands in Mexico, Korea, and Japan, *Journal of Product & Brand Management, 17, (3),* 163-174.

Leggett, W.F. (1944). *Ancient and medieval dyes.* Brooklyn, NY: Chemical Publishing. Literature Review", Proceedings of the International Conference on Cleaner Technologies and Environmental Management, PEC, Pondicherry, India.

Maeda, N, Wada, I, Kawakami, M, Ueda, T & Pushpalal, G., (2001). 'Development of a New Furnace for the Production of Rice husk Ash ', paper presented to Seventh CANMET/ACI International Conference on Fly Ash, Silica Fume, Slag and Natural Pozzolans in Concrete Chennai (Madras), India, 22-27 July 2001.

Mahamud, A., (1986). 'Burning of Rice husk for Power Generation', paper presented to ASEAN Conference on Energy from Biomass: Development Towards Efficient Utilization of Biomass Energy, Penang, Malaysia, 13-15 October.

Mathias, A.J., (2004). *Successful Development of A Cogeneration Project: A Case Study in the Rice Milling Industry*, The Centre point Hotel, Bandar Seri Begawan, 23-24 November, <http://www.cogen3.net/presentations/asean/cogenweek2004brunei/Riceindustrycogeneration.pdf>.

Max W., Wolfgang K., & Kurt K.(1920). Gestalt theory of visual perception *www.creativebloq.com/graphic-design/gestalt-theory-1013496 accessed on 6th August,2016*

McIntyre J. E., & Daniels, P. L., (1997). *Textile Terms and Definitions* (10th ed.). Manchester: The Textile Institute.

Mehta, P.K., & Pitt, N., (1976). 'Energy and industrial materials from crop residues', *Resource Recovery and Conservation, 2, (1),* 23-38.

Meinke, T., (2012). Fabric fabric decorationtechniques.http://meinketoy.com/blog/fabric-fabric decoration/

Murray, A & Price, L (2008). Use of Alternative Fuels in Cement Manufacture: Analysis of Fuel Characteristics and Feasibility for Use in the Chinese Cement Sector, Office of Technology Cooperation and Assistance, U.S. Environmental Protection Agency.

Musa, M. (2012) Research Design for Students in Education, Ahmadu Bello University Zaria1 (1)

Muthadhi, M., Anitha, R. & Kothandaraman, S., (2007). Rice husk ash properties and its uses A Review. *Journal of the Institution of Engineers (India) 88*, 50-55.

Nair, D.G., Jagadish, K.S., & Fraaij, A., (2006). 'Reactive pozzolanas from Rice husk ash: An alternative to cement for rural housing', *Cement and Concrete Research, 36, (6),*1062-71.

Nehdi, M., Duquette, J., & El Damatty, A., (2003). 'Performance of Rice husk ash produced using a new technology as a mineral admixture in concrete', *Cement and Concrete Research, 33, (8),* 1203-10.

Neil, M., (2007). Fabric decoration, what is it, how is it changing and what are the ingredients of a successful curriculum.Retrieved from *http://www.adm.heacademy.ac.uk/resources/features/fabric decoration-what-is-it-how-is-it-changing-and-what-are-the-ingredients-of-a-successful-curriculum/* on the 12 June, 2014

Nigel, C. (1982) & Leurs, B. (2014).Design theory Retrieved from *www.slideshare.net/Leursism/design-theory-lecture01 on 6th August,2016*

Nguyen, N.T., (2005). 'Rice husk potential and utilization in Vietnam', paper presented to Biomass Asia Workshop 2, Bangkok, Thailand, 13-15 December.

Nworgue, B. G. (1991) Educational Research: Basic Issues and Methodology. Ibaban: Wisdom

Oh J., & Fiorito S.S., (2002). Korean women's clothing brand loyalty, *Journal of Fashion Marketing and Management, 6, (3),* 206-222.

Olivier, P., & Hyman, T., (2012). "Biomass Gasification and the Benefits of Biochar". Engineering, Separation and Recycling LLC. Retrieved 2014-06-06.

Otto, W., & Flörke, (2008). "Silica" in Ullmann's Encyclopedia of Industrial Chemistry, Weinheim: Wiley-VCH, .doi:10.1002/14356007.a23_583.pub3

Opara, H.E. (2011). Strength of Blended Cement Sandcrete &Soilcreteblocks Containing rice husk ash. Retrieved from *www.ijert.org/.../strength-of-blended-cement-sandcrete-asoilcreteblocks-containing-c* on the 12th April, 2016.

Oyekan, G.L. & Kamiyo,O.M.(2008) Effect of Nigerian Rice husk ash on some engineering.

Oyetola E. B. & Abdullahi M., (2006), The Use of Rice husk ash in Low-cost Sandcrete Block Production, Leonardo Electronic *Journal of Practices and Technologies, Issue 8*,58-70.

Ozipek (2012) Factors affecting branding with special reference to clothing industry. International conference textiles and fashion , Banglok Thailand

Padhi, B.K., & Patnaikb, C., (1995). 'Development of Si,N,O, S&N, and Sic Ceramic Materials Using Rice husk', *Ceramics International, 21, (213-220),* 269-72.

Patel, M, Karera, A & Prasanna, P (1987). 'Effect of thermal and chemical treatments on carbon and silica contents in Rice husk ', *Journal of Materials Science, 22, (7),* 2457-64.

Peters, R.H. (1967). *Textile Chemistry: II*. New York, NY: Elsevier.

Phnom Penh, Cambodia,26-27March,< http://www.cd4cdm.org/Asia/Cambodia/First%20National%20Workshop/GAngkor%20Rice-MJ-March03.pp#256, 1,Side 1>

Prasetyoko, D., Ramli, Z., Endud, S., Hamdan, H. & Sulikowski, B., (2006). 'Conversion of Rice husk ash to zeolite beta', *Waste Management, vol. 26,(10),*1173-9.

Price, A., Cohen, A., & Johnson, I. (2005). *J.J. Pizzuto's fabric science.* New York:Fairchild Publications.nproperties of sandcrete blocks and concrete. Psychometrika, 16: 297-334 Pulishers Ltd.

Raffia Resist http://www.vam.ac.uk/content/articles/a/adire-indigo-resist-dyed-cloth-from-yorubaland-nigeria/

Saha, B.C., & Cotta, M.A., (2007). 'Enzymatic saccharification and fermentation of alkaline peroxide pretreated rice hulls to ethanol', *Enzyme and Microbial Technology, 41, (4),* 528-32.

Saha, B.C., & Cotta, M.A., (2008). 'Lime pretreatment, enzymatic saccharification and fermentation of rice hulls to ethanol', *Biomass and Bioenergy, 32, (10),* 971-7.

Saha, B.C., Iten, L.B., Cotta, M.A., & Wu, Y.V., (2005). 'Dilute Acid Pretreatment, Enzymatic Saccharification, and Fermentation of Rice Hulls to Ethanol', *Biotechnol. Prog., 21,* 816-22.

Seo, E.S.M, Andreoli, M., & Chiba, R., (2003). 'Silicon tetrachloride production by chlorination method using Rice husk as raw material', *Journal of Materials Processing Technology, 141, (3),* 351-6.

Siqueira, E.J., Yoshida, I.V.P., Pardini, L.C., & Schiavon, M.A., (2009). 'Preparation and characterization of ceramic composites derived from Rice husk ash and polysiloxane', *Ceramics International, 35, (1),* 213-20.

Solomon M.R. ,& Rabolt N.J., (2004). *Consumer Behavior in Fashion,* Prentice Hall, ISBN-10: 013081122X, New Jersey.

Stroeven, P., Bui, D.D., & Sabuni, E., (1999). 'Ash of vegetable waste used for economic production of low to high strength hydraulic binders', *Fuel, 78, (2),* 153-9.

Stucley, C., (2006). *Prospects for Pyrolysis Bio-oil in Australia,* the Esplanade Hotel, Fremantle 6-7 December, <http://www.renoil.com.au/BioenergyConf.pdf>.

Sujirote, K & Leangsuwan, P., (2003). 'Silicon carbide formation from pretreated Rice husks', *Journal of Materials Science, 38,* 4739-44.

SybiL, P. P., (1958). "McGraw Hill Encyclopedia of Science and Technology", McGraw Hill, Inc. Limited 6th edition 15, 466-467.

Thailand Environment Institute (TEI) (2004). Life Cycle Inventory for Cement Product and Steel Making towards Sustainable Development: Final report for the Thailand Research Fund, Thailand Environment Institute (TEI), Bangkok.

The EC-ASEAN COGEN Programme, (1998). Evaluation of *Conditions for Electricity Production Based on Biomass: Final report for RAMBOLL*, The EC-ASEAN COGEN Programme, Bangkok.

Toan, P.K., Cuong, N.D., & Leon, M.A., (2005). 'Activities and Achievements of a Biomass Briquetting Project in Vietnam', paper presented to World Renewable Energy Regional Conference, Jakarta, Indonesia.

Vainker, S. (1990). Chinese Silk: A Cultural History*Design* of Superhydrophobic Textile *Surfaces*. – Hoon Joo Lee ,Dekker, New York,. 9. Pötschke . Retrieved from *https://www.fitnyc.edu/textile-surface-design/* on the 10th June, 2014

Vinyl, (2008). Western wear Scrapyard Retrieved from *https://www.pinterest.com/pin/383228249515549666/ on the 10th June 2014*

Wada, Y. I., (2002). *Memory on Cloth - Shibori Now*. New York: Kodansha America.

Wada, Y. I., Rice, M. K. & Barton, J. (1999). *Shibori – The Inventive Art of Japanese Shaped Resist Dyeing*. New York: Kodansha International LTD.

Wallheimer, B., (2010). "Rice hulls a sustainable drainage option for greenhouse growers". Purdue University. Retrieved on 30th August 2014.

Warren, B.E. & Farrell, D.J. (1990). The nutritive value of full-fat and defatted Australian rice

Williams, P.T., & Nugranad, N., (2000). 'Comparison of products from the pyrolysis and catalytic pyrolysis of Rice husks', *Energy*, vol. 25, no. 6, pp. 493-513.
Winston Inc

Wolf, (*2005*) Batik as a Cultural Identity of the Yoruba: Hand ... - Researchers World. Retrieved from *www.researchersworld.com/vol3/issue2/vol3_issue2_3/Paper_04.pd*f on the 10th june,2014

APPENDIX-I

DEPARTMENT OF VOCATIONAL & TECHNICAL EDUCATION
AHMADU BELLO UNIVERSITY, ZARIA, NIGERIA.
FACULTY OF EDUCATION

VICE CHANCELLOR: **Prof. Ibrahim Garba** (B.Sc., M.Sc. (A.B.U.); Ph.D. (London) D.I.C.) Telephone: 069-51755, 50692
HEAD OF DEPARTMENT: **Professor A. A. Udoh** (B.Ed. (Hons) Nsukka; M. Ed. & Ph.D. Bus Edu. [A.B.U.])

Your Ref: _____ M.Ed/Educ/39297/2012-2013

Our Ref: _____

Date: 6th July, 2015

Letter of Identification

UKWUOMA NWOSU PERPETUA – M.ED/EDUC/39297/2012-2013

This is to certify that the above mentioned name is a Postgraduate student (M.Ed Home Economics) in the Department of Vocational and Technical Education, Faculty of Education, Ahmadu Bello University, Zaria carrying out a research topic: Assessments of Rice Husk as Resist Paste for Surface Design in Teaching and Learning of Textile Design in Colleges of Education, Niger State.

Please, kindly give her every assistance she may require.

Professor A.A. Udoh
HEAD OF DEPARTMENT

30th June, 2015

APPENDIX-II

QUESTIONNAIRE

ASSESSMENT ON RICE HUSK AS A RESIST AGENT FOR FABRIC DECORATION IN TEACHING AND LEARNING OF TEXTILE DESIGN

(RHRAFDTLTD)

Home Economics Section
Department of Vocational and Technical Education,
Faculty of Education,
Ahmadu Bello University, Zaria.

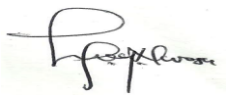
Dear Respondents,

REQUEST TO COMPLETE QUESTIONNAIRE

I am a postgraduate student of the department and institution stated above. This questionnaire has been designed as one of the research tools for collecting data on the Assessment of Rice husk as Resist agent for Fabric decoration in the Teaching and Learning of Textile Design in Colleges of Education, Niger State. Your honest and prompt cooperation in completing this questionnaire is absolutely necessary to the success of the study. Thus it is hoped that outcome of the study will help in bringing about a new knowledge in textile design and to serves as a waste management strategy. You can be rest assured that your responses will be treated confidentially and will only be used specifically for the purpose of this research work.

Thanks for your cooperation

Yours faithfully,



Perpetua Ukwuoma NWOSU

PART A:

Bio Data of the Respondents

1INSTRUCTION: Please tick as appropriate in the space provided below

Name of the Institution.....
Department.....
Gender: (a) Male ( ) (b) Female ( )
Age: (a) 16-25 ( ) (b) 26- 35 ( ) (c) 36-45 ( ) 46-55 ( )
Level: NCE I ( ) NCE II ( )

PART B:

INSTRUCTION

Please read the following statements carefully and indicate your opinion about the statements by ticking in one of the boxes provided on the right hand side using the scale below to answer the following questions.

Strongly Agree (SA).....4
Agree (A).....3
Disagree (D).....2
Strongly Disagree (SD)...1

SECTION I

S/N	ACCEPTABILITY LEVEL OF FABRIC DESIGNS MADE FROM RICE HUSK RESIST AGENT	SA	A	D	SD
1.	Rice husk as resist agent does not affect the texture of the fabric				
2.	Rice husk resist agent is adequate on cotton fabric				
3.	The patterns created from rice husk is sharp and precise				
4.	The fabric produced from rice husk resist agent is attractive and marketable.				
5.	Rice husk resist agent give much crackles to the fabrics				
6.	One can deduce that rice husk was used in the fabric as a result of particles left after production				
7.	The fabric produced from rice husk resist agent is as good as other fabrics produced from other resist agent				

SECTION II

INSTRUCTION:

Please read the following statements carefully and indicate your opinion about the statements by ticking in one of the boxes provided on the right hand side using the scale below to answer the following questions.

Excellent.....4

Good.....3

Fair.....2

Poor.....1

S/N	Item	Resist agents	Excellent	Good	Fair	Poor
8.	Ease of penetration of dye through the resist agent	Rice husk agent				
		Cassava agent				
9.	Ability of the agent to resist the dye in covered areas	Rice husk agent				
		Cassava agent				
10.	Colour intensity of the fabric after dyeing	Rice husk agent				
		Cassava agent				
11.	Texture of fabric after dyeing	Rice husk agent				
		Cassava agent				
12.	Ability of the paste to retain its shape and attractiveness of fabric after dyeing	Rice husk agent				
		Cassava agent				
13.	Ease of washing out of the paste	Rice husk agent				
		Cassava agent				

PART C: RESEARCHER'S ASSESSMENT SCORE SHEET

The researcher used the following grade points to assess the students' performance in the fabric dyeing with rice husk resist agent.

Excellent.....4

Good.....3

Fair.....2

Poor.....1

Assessment on the performance levels of students taught fabric dyeing with rice husk resist agent.

S/N	Item	Excellent	Good	Fair	Poor
14.	I actually understood the practical conducted with fabric dying.				
15.	The entire practical conducted were of waste of time to me.				
16.	The procedures used were simple and easy for me to comprehend				
17.	I can comfortably produce fabric dye with rice husk resist agent				
18.	Attractiveness and neatness of fabric after dyeing (starching and ironing)				
19.	I sustain my academic with fabric dying after the practical conducted.				
20.	I can hardly perform fabric dying using rice husk resist agent after the experiment				

APPENDIX-III

LESSON PLAN FOR PRODUCTION OF RICE HUSK RESIST AGENT AND THE APPLICATION FOR FABRIC DECORATION

Date 3rd February, 2016
Duration 2hours
Class NCE I and NCE II
Gender female
Age 16-25
Course Code HEC 112 and HEC 221
Course Title Introduction to Textile science and Textile Design
Major Topic: Production of Rice husk resist agent for fabric decoration

Behavioural objective: By the end of the lesson the students should be able to :

a. Produce resist agent using rice husk
b. Use the resist agent for fabric decoration
c. Compare the use of rice husk resist agent and cassava resist agent for fabric decoration.
d. Carry out individual practical work on rice husk resist agent using two yards of brocade fabric. To be packaged and submitted for assessment.

Instructional material: Rice husk, antisol, stencil ,measuring cup and spoon, water, bowls and bucket, cassava flour, pot, vat dyes and it chemical, stove, etc

Entry behaviour: The students have been taught on how to dye fabric using tie and dye method

Introduction: The teacher review the previous knowledge and drives into the new topic by asking the student what they use rice husk in their different community. Is rice useful to you in any way if yes state it.

Presentations:

Step I: The teacher explains to the student what each of the items e.g. rice husk, antisol cassava flour, dye and dye stuff are to be used for:

Rice husk is an outermost layer of protection encasing a rice grain and it is produced during rice milling it is called chaff or dursa in hausa as used in Kontagora here.

Antisol also known as carboxymethyl (CMC) cellulose or cellulose gum is an environmental chemical produced from wood pulp which serves as a binding agent to the rice husk.

Cassava flour is also used as a resist agent in resist dyeing method

Dyes are chemical agents that give colours to fabrics

Stencil: A hard cardboard paper that have cuts of different patterns

Step II : The measurement and procedure in the production of the resist agent

Materials	Measurement
Antisol (Carboxymethyl cellulose (CMC) or cellulose gum,)	Four (4) table spoons full
Water	2.5 litres
Rice husk	twelve (12) milk tins

The antisol was measures into a bowl containing the quantity of water stated and the mixture was stirred properly and allowed to soak for 30 minutes. Then rice husk was measured and poured into this mixture and stirred properly. And this gives us the rice husk resist agent.

STEP III: The use of rice husk resist agent for fabric decoration

The white brocade fabrics (20 yard) was prewashed and dried in order to remove all the factory treatment given to it and to allow the dye to penetrate properly. Then some of fabrics was dyed with cool colours first to change the background colour and was allowed to dry.

The stencils was placed on the fabric to obtain different patterns and rice husk resist agent was applied on the areas where the patterns are created and kept to dry (stencil method), also broom was dipped into the rice husk resist agent bowl and was splashed on the fabric and kept to dry (splash method). And this was allowed to stand for 30 minutes under the sun and the dried fabrics was soaked into dye baths containing different dye colours and this was allowed to stand for 3 to 5 minutes and was brought out and washed to remove the rice husk. And the dyed fabrics were spread under the shade.

STEP IV: Compare the use of rice husk resist agent and cassava resist agent for fabric decoration.

The prewashed fabrics were divided into two equal halves and spread on a flat surface, the cassava flour was mixed with cold water in a pot and the pot was placed on a low heat and stirred consistently until a paste was formed. The cassava resist paste was applied on the surface of fabric with the use of stencil to obtain pattern, and a cut was made on this to differentiate it from that of rice husk, the same patterned stencil was equally used on the other yard of fabric but rice husk resist agent was applied on this(stencil method) this was allowed to dry, also another method was obtained with splashing method using the two resist agents differently as done with stencil, and it was allowed to dry. After drying, the dye bath was prepared and the stencil method were dipped into the dye both of them at the same time and allowed to stand for 4 minutes and it was brought out and washed thoroughly then spread under the shade. Also the splashed method fabrics

were dipped into another colour and allowed to stand for 5 minutes and washed also. Then it was spread under the shade. The results obtained from all these were starched and pressed properly for presentation.

Evaluation: The Teacher evaluates the lesson by asking the students to fill in the questionnaire based on the practical conducted,

Conclusion: the teacher concludes the lesson by asking the students to : pick a ballot paper to instruct them the type of resist agent (tie and dye, use of rice husk, use of cassava resist agent, use of pebbles, folding method etc.) to use in decorating their fabrics.

Assignment:

i. Produce a resist agent using rice husk or cassava agent as the ballots says,
ii. Apply this resist agent on fabric using stencil,
iii. Apply any other methods picked,
iv. Dye this fabric using any colour of dye, wash properly and dry, starch and press and submit
v. Practice this using a two yards of cotton brocade fabric and submit next week
vi. The practical was carried out under the supervision of the lecturer in charge, and the result obtained were submitted and marked for examination purposes.

APPENDIX-IV

PICTURES OF THE PRACTICAL WORK CONDUCTED WITH THE RESPONDENTS



Antisol (CMC) poured into water

Plate 1



Mixture of Antisol and water (binding agent)

Plate 2



Researcher measuring the CMC into bowl

Plate 3



Rice husk being measures into the antisol solution

Plate 4



Rice husk being added to the CMC solution to get rice husk resist agent

Plate 5



Rice husk resist agent being applied on the surface of the fabric using a stencil to serve as a guide

Plate 6



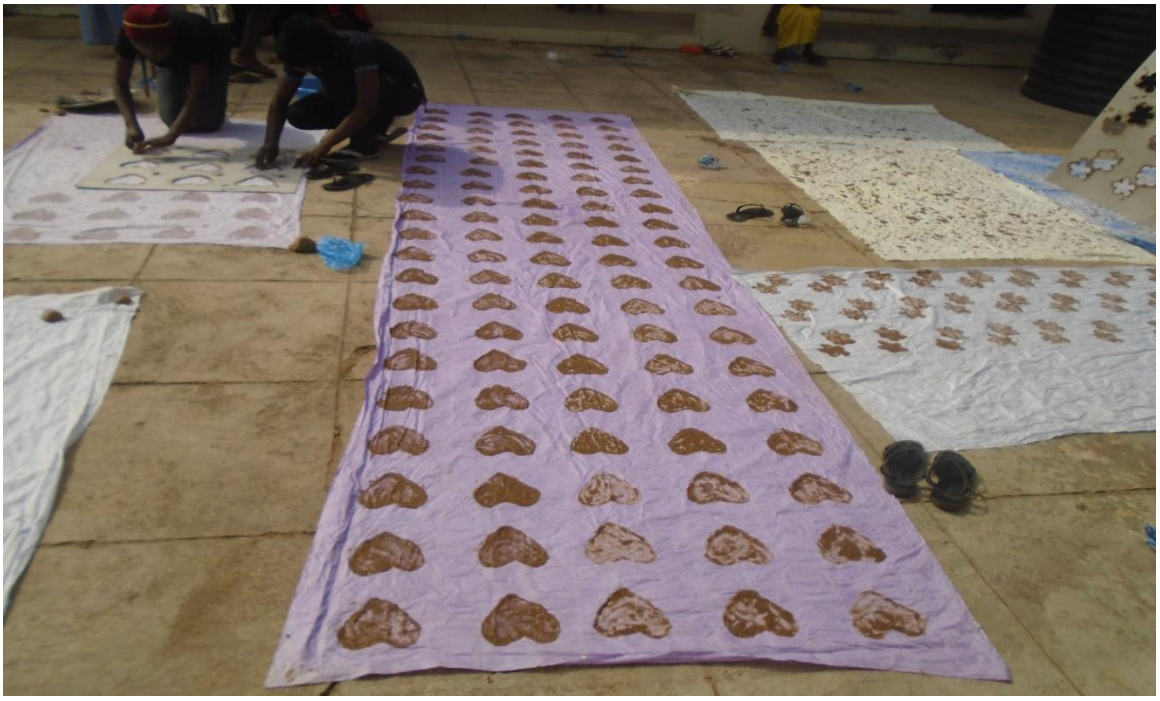
Rice husk resist agent used in fabric design

Plate 7



Rice husk resist agent used in fabric design, serving as a resist agent to the selected areas.

Plate 8



Rice husk resist agent applied on the surface of the fabrics for design using splashing and stencil methods

Plate 9





Rice husk resist agent applied on the surface of the fabric for design with the help of stencils of different pattern

Plate 10



Pattern created using a bowl and a pencil

Plate 11



Pattern drawn all over the fabric

Plate 12





Application of rice husk resist agent on the surface of fabric for embellishment.

Plate 13




Dyeing process of dried fabric designed with rice husk resist agent.

Plate 14





Washing of the rice husk resist agent from the fabric after dyeing.

Plate 15



Washing of the rice husk resist agent from the fabric after dyeing.

Plate 16



Rice husk resist agent

Plate 17





The resist agent applied on surface of the fabric for embellishment

Plate 18



Dried fabric designed with rice husk resist agent

Plate 19





white brocade fabric dyed yellow to get a background

Plate 20



Yellow background gotten

Plate 21



Splashing method using rice husk resist agent and the dyeing process taking place

Plate 22



Finished splash method

Plate 23



Rice husk resist agent applied on the surface of the fabric.

Plate 24



The dyeing process taking place with fabrics designed with rice husk resist agent

Plate 25



Dyed fabrics designed with rice husk resist agent

Plate 26



Dyed fabrics designed with rice husk resist agent

Plate 27



Two equal fabrics resisted with rice husk and cassava resist agent to show comparison between the two resist agents

Plate 28



The fabrics patterned with rice husk and cassava resist agent dipped into dye bath.

Plate 29



The dyed and washed fabrics designed with rice husk and cassava resist agents

Plate 30

APPENDIX –V

Out Put Data

Research question one

To what extent does the use of rice husk as a resist agent influence the teaching and learning of fabric decoration?

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Rice husk as a resist agent	32	19.2500	1.50269	.26564

One-Sample Test

	Test Value = 32					
	t	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Rice husk as a resist agent	14.938	31	.000	19.25000	17.7082	18.7918

What is the difference in the acceptability rate of fabric designs made from rice husk resist agent and cassava resist?

There is no significant difference in the acceptability rate of fabric designs made from rice husk resist agent and cassava resist.

Group Statistics

	VAR00002	N	Mean	Std. Deviation	Std. Error Mean
VAR00001	Rice husk	15	20.0667	.79881	.20625
	Cassava resist	17	18.6471	1.53872	.37319

Independent Samples Test

		Levene's Test for s		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
VAR00001	Equal variances assumed	11.644	.002	3.208	30	.003	1.41961	.44253	.51585	2.32337
	Equal variances not assumed			3.329	24.640	.003	1.41961	.42640	.54078	2.29844

How does the use of rice husk as a resist agent affect stencil?

There is no significant difference in the use of rice husk as a resist agent on stencil.

Group Statistics

	VAR00002	N	Mean	Std. Deviation	Std. Error Mean
VAR00001	Rice Husk	10	19.4000	.96609	.30551
	stencil	22	17.8636	1.72642	.36807

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
VAR00001	Equal variances assumed	4.281	.047	2.619	30	.014	1.53636	.58668	.33819	2.73453

	Equal variances not assumed			3.212	28.424	.003	1.53636	.47834	.55718	2.51555

What is the effect of rice husk as a resist agent when applied using splashing, hand drawing, squeeze?

There is no significant effect of rice husk as a resist agent when used as with splashing, hand drawing, squeeze.

Group Statistics

	VAR00002	N	Mean	Std. Deviation	Std. Error Mean
VAR00001	1.00	16	17.8125	2.16699	.54175
	2.00	16	19.8750	1.25831	.31458

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
VAR00001	Equal variances assumed	6.067	.020	-3.292	30	.003	-2.06250	.62646	-3.34190	-.78310
	Equal variances not assumed			-3.292	24.083	.003	-2.06250	.62646	-3.35521	-.76979

Table 4.5 Research Question one

Descriptive Statistics

	N	Mean	Std. Deviation
v1	124	1.1048	.30759
v2	124	1.1290	.49333
v3	124	3.6452	.84770
v4	124	3.3468	1.17594
v5	124	1.2581	1.06589
Valid N (listwise)	124		

Table 4.6 Research Question two

Descriptive Statistics

	N	Mean		Std. Deviation
	Statistic	Statistic	Std. Error	Statistic
v1	124	4.5210	.00000	.00000
v2	124	3.3903	.05181	.57690
v3	124	3.8355	.02215	.24667
v4	124	1.0323	.03609	.40194
v5	124	2.5484	.13995	1.55838
v6	124	3.2323	.02666	.29685
v7	124	4.5230	.00000	.00000
Valid N (listwise)	124			

Table 4.7 Research Question three

Descriptive Statistics

	N	Mean	Std. Deviation
VAR00001	124	4.0000	.00000
VAR00002	124	3.8468	.47787
VAR00003	124	3.9355	.24667
VAR00004	124	3.9280	.25953
VAR00005	124	2.5484	1.55838
VAR00006	124	1.0000	.00000
VAR00007	124	4.0000	.00000
Valid N (listwise)	124		

Table 4.8 Research Question four

Descriptive Statistics

	N	Mean	Std. Deviation
VAR00008	124	1.0323	.40194
VAR00009	124	1.8306	1.52338
VAR00010	124	3.7823	.71636
VAR00011	124	2.4194	1.91314
VAR00012	124	3.7097	.81425
VAR00013	124	3.1210	1.50659
VAR00014	124	3.6774	.91552
VAR00015	124	3.7742	.41981
VAR00016	124	3.9677	.17740
VAR00017	124	3.6048	.88178
VAR00018	124	3.4113	1.23639
VAR00019	124	1.6855	1.30892
Valid N (listwise)	124		