International Journal of Public Administration and Management Research (IJPAMR), Vol. 3, No 3, May, 2016.
Website: http://www.rcmss.com. ISSN: 2350-2231 (Online) ISSN: 2346-7215 (Print)
Egwuda, John O., Iyaji, S. O. & Kolawole O. Basiru, 2016, 3(3):55-63

EFFECTS OF SELECTED COLOURS IN A BUILT ENVIRONMENT: A STUDY OF FEDERAL POLYTECHNIC IDAH PREMISES

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ABSTRACT

This study examines the principles of colour harmony in an architectural environment for aesthetics and utilitarian purposes. Looking at the Federal Polytechnic, Idah community for a focus, the paper adopts the functional and sociological approach to establish the relevance of colourimetry in a built up environment. Colours have always had great influence on people, and since ancient times have been used symbolically. In decoration it is so important that the chosen colours should be in harmony with both the aesthetics and the utility of the building. A well chosen colour scheme can inspire, induce cheerfulness, encourages cleanliness and well being. In factories and industrial premises, it can be used to make seeing easier, promote mental alertness and so increase efficiency and production. By careful selection, colour can be used to make small rooms appear larger and larger rooms more cosy: to brighten rooms or make them restful. The specific objectives of this exposition is to explore the basic requirement that inspires colour choice; to unravel the principles of colour harmony that is suitable for any climatic condition of the locality; to proffer the chromatic colour circle as a professional mechanism for harmonious colour distribution in an architectural environment; to unveil the adverse effects of colour rioting to human health; and to ascertain the correctness of the chosen colours on building of the Federal Polytechnic, Idah, through the study of previous literary contributions and direct observations. While the approach is primarily functional thus, the greater importance of iconography and symbolism, the formalistic aspects cannot, however, be totally ignored. While we uphold the role of the environment and man's awareness of his existence, some challenges emerged: how far does the chosen colours of finishes on the building relate to the socio-cultural needs of the community where the structures are located? How does the adopted colour schemes on buildings of the Federal Polytechnic, Idah answer to the domestic and industrial requirements according to professional ethics? What is the functional or the scientific bases for the colour coding on the institutions buildings? Are the colours selected for roofs and walls of the polytechnic community environmentally friendly as it concerns the present geographic trend of global warming? These and other probes are the questions which this study sets out to answer as technological advancement is becoming more relevant to Nigeria as economic empowerment.

Keywords: Colours, Environment, Building, Premises, and Aesthetics

INTRODUCTION

As science of behavior adopts the strategy of physics and biology, the autonomous agent to which behavior has traditionally been attributed is replaced by the environment, the environment in which the species evolved and in which the behavior of the individual is shaped and maintained. The vicissitudes of

"environmentalism" shows how difficult it has been to make this change. That a man's behavior owes something to antecedent events and that the environment is a more promising point of attack than man himself has long been recognized. As crane observed, "a program to change things not just to convert people" was a significant part of the English, French and Russian revolutions. It was Robert Owen, according to Trevelyan, who first "clearly grasped and taught that environment makes character and that environment is under human control or, as Gilbert Seldes wrote, "that man is a creature of circumstance, that if you changed the environments of thirty little Hottentots and thirty little aristocratic English children, the aristocrats would become Hottentors, for all practical purposes, and the Hottentots little conservatives."

The perceiving and knowing which arise from verbal contingencies are even more obviously products of the environment. We react to an object in many practical ways because of its color; thus, we pick and eat red apples of a particular variety but not green. It is clear that we can "tell the difference" between red and green, but something more is involved when we say that we know that one apple is red and the other green.

It is tempting to say that knowing is a cognitive process altogether divorced from action, but the contingencies provide a more useful distinction. When someone asks about the color of an object which he cannot see, and we tell him that it is red, we do nothing about the object in any way. It is the person who has questioned us and heard our answer who makes a practical response which depends on color. Only under verbal contingencies can a speaker respond to an isolated property to which a nonverbal response cannot be made. A response made to the property of an object without responding to the object in any way is called abstract.

Abstract thinking is the product of a particular kind of environment, not of a cognitive faculty. The evidence for a crude environmentalism is clear enough. People are extraordinarily different in different places, and possibly just because of the places.

The role of the environment is particularly subtle when what is known is the knower himself. If there is no external world to initiate knowing, must we not then say that the knower himself act first? This is, of course, the field of consciousness or awareness. The charge is a serious one and should be taken seriously. Man is said to differ from the other animals mainly because he is "aware of his own nature", he alone follows the classical injunction "know thyself." Any analysis of human behaviours which neglected these facts would be defective indeed.

This paper therefore examines the psychological effects of the selected hues in the immediate architectural environment of ours; with special interest in the color coding of the Federal Polytechnic, Idah as a community.

Colours have always had great influence on people and since ancient times have been used symbolically. In decoration it is very important that the colours chosen should be suitable for the purpose and the use of the building. A well chosen colour scheme can inspire, induce cheerfulness, encourages cleanliness and well being.

In factories and industrial premises, it can be used to make seeing easier, promote mental alertness and so increase efficiency and productivity. By careful selection, colour can be used to make small rooms appear larger and large rooms more cosy; to brighten small rooms or make them restful.

DEFINING COLOR

Colour (British English; or color (American spelling); "is the visual perceptual property corresponding in humans to the categories called red, blue, yellow, et cetera. Bohren (2006).

Colour derives from the spectrum of light interacting in the eye with the spectral sensitivities of the light receptors. Colour categories and physical specifications of color are also associated with objects or materials based on their physical properties such as light absorption, reflection, or emission spectra.

Because perception of color stems from the varying spectral sensitivity of different types of cone cells in the retina to different parts of the spectrum, colours may be defined and quantified by the degree to which they stimulate these cells. These physical or psychological quantifications of color, however, do not fully explain the psychological perception of color appearance, Waldman (2002).

The science of colour is sometimes called **Chromatics**, **Colorimetry**, or simply Colour Science. It includes the perception of colour by the human eye and brain, the origin of colour in materials, colour theory in art, and the physics of electromagnetic radiation in the visible range (that is what we commonly refer to simply as **light)** Berlin and Kay (1969).

The study of colour may be approached from any of these five perspectives; that of the physiologist, the chemist, the physicist, the psychologist or the artist. "the physiologist is concerned with the way in which the eye perceives colour. The chemist studies the chemical properties of natural and artificial colouring matter used in the manufacture of dyes and paints. To the physicist, the significance of colour is merely its wavelengths and its intensities. The psychologist shows how a person is affected by one another. The artist or the designer is concerned mostly with colour in vision and colour in pigment" (Uzoagba, 1982). There are therefore colours of light and colours of pigment. Mixtures of coloured pigment behave differently from mixtures of coloured light; they also differ in the way the eye perceives these mixtures.

Scientifically, colour is the sensation cause on the eye by different wave-lengths of light. The source of all colours is light. Without light, colour does not exist. The purest form of light originates from the sun and is known as white light. When light strikes a surface, waves of certain lengths are absorbed and others are reflected. It is the reflected waves which are picked up by our eyes and are registered by the brain as colours.

COLOUR: ITS ORIGIN AND MEANING

Colour originated with the great physicist Sir Isaac Newton who experimented with the glass prism in 1666. He concentrated on the nature of spectrum we find in the rainbow for his experiment. Newton named these colours red, orange, yellow, green, blue, indigo, and violet. Subsequent experiments of Sir Newton revealed that combination of these light waves result to white light (natural) light. Colour is not in the glass but in the light. White light is a mixture of all the colours of the spectrum (Newton (2003)).

SEEING COLOUR

An object which is seen by a person with normal vision as red is absorbing all the light of other wavelengths and reflecting only the waves of red length; the sensation caused by these waves meeting the eye is registered as red by the brain, Fulcher (1981). A white surface reflects all waves, whereas a black surface absorbs all, reflecting none.

COLOUR PERCEPTION (Colour Vision)

Although Aristotle and other scientists had already written on the nature of light and other colour vision, it was not until Newton that light was identified as source of the colour sensation.

In 1810, Goethe published his comprehensive Theory of Colours in which he ascribed physiological effects to colour that are now understood as psychological. In 1801 Thomas Young proposed his trichromatic theory, based on the observation that any colour could be matched with a three lights. This theory was later refined by James Clerk Maxwell and Hermann von Helmholtz. As Helmholtz puts it, "the principles of Newton's law of mixtures were experimentally confirmed by Maxwell in1856. Young's theory of colour sensation, like

so much else that this marvelous investigator achieved in advance of his time, remained unnoticed until Maxwell directed attention to it.

THE SENSATIONS OF VISION

The ability of the human eye to distinguish colours is based upon the varying sensitivity of different cells in the retina to light of different wavelengths. Humans being trichromatic, the retina contains three types of colour receptor cells or cones. One type relatively distinct from the other two is most responsive to light that we perceive as blue or blue-violet, with wavelengths around 450nm; cones of this type are sometimes called short wavelengths cones, S cones or blue cones. The other two types are closely related genetically and chemically: middle-wavelength cones, M cones, or green cones are mostly sensitive to light perceived as green with wavelength around 540nm, while the long wavelengths cones, L cones, or red cones, are most sensitive to light we perceive as greenish yellow, with wavelengths around 570nm

Lights, no matter how complex its composition of wavelengths, reduced to three colour component by the eye. For each location in the visual field, the three types of cones yield three signals based on the extent to which each is stimulated. These amounts of stimulation are sometimes called Tristimulus values.

ORGANISATION OF HARMONIOUS COLOURS IN BUILDINGS

When choosing colour scheme for any room, consideration should be given to its size, aspect - whether if faces north, south, east or west – and the use to which it is put. A room which gets only a small amount of natural light or which faces north or east should not have large areas of cold colours – blue, green or purple – but be coloured with light but warm colours. Rooms facing west and south can take blues and greens quite well. Small rooms require light colour; large rooms can take stronger colours.

Colours which stimulate and excites, such as yellows and reds are useful for schools, theatres and restaurants. Large areas of white and broken white with small areas of red, orange and yellow also produce stimulating effects and can be used to advantage in factories, Tubb (1976) Orange is the warmest of all colours and is best mixed with white; at full strength it can be used to liven up browns and greys. Purples and mauves are soothing and very suitable for bedrooms. “soft greens are very restful and can be used for bedrooms and launges. Browns are restful and warming but need touches of yellow and orange or gold to cheer them up. Light greys mixed with red, orange and yellow are suitable backgrounds or foils for brighter colours. Black need not to be depressing if used in small areas and can often sharpen and steady a colour scheme,” Tubb (1979).

Halls, passages and staircases providing a link with all other rooms should have a warm friendly aspect and not clash with the colours of the rooms. A useful plan is to have large areas of soft warm colours with smaller areas of darker or greyed colours and accents of bright strong colour. It is useful to have important features such as the main entrance doors in a strong colour; likewise the process can be reversed, the wall being a strong colour and the doors a much lighter colour.

Living rooms require colours which form a good background and are suggestive of comfort. The colours should be quiet and restful without being dull. Kitchens should be light and bright, suggestive of hygiene and cheerfulness. Public rooms like restaurants, cafes, cinema and theatre halls, which are occupied for a comparatively short time, can be given stronger colours than private rooms.

COLOUR AND THE ENVIRONMENT

The appearance of any colour is influenced by the colour next to it, its background and the amount and the quality of light falling upon it. A standard hue on white will appear richer and darker than when on light grey, and very much brighter and lighter on a very dark grey or black. Certain pairs of colour combinations show up more clearly than others. Black on yellow, green on white, blue on white and black on white are

good examples, but if the order is reversed the sharpness or contrast is not so apparent, effects which are well known to sign writers.

Combinations of very similar hues can be disturbing. Harmony can usually be secured if the colours follow the natural order of progression from light to dark, which there are two spheres, a red and a green. The first goes from yellow the lightest through yellow, orange, orange-red, red, red-purple to purple the darkest. The second from yellow through yellow-green, green, blue-green, blue, blue-purple. Thus, if yellow and blue-green are used together, the yellow should be the lighter of the two. If this natural order of colour is reversed, then the result will be discordant. When a colour is changed by the colour alongside it, this can be remedied by adding to the changed colour some of the colour causing the change.

COLOUR AND HEALTH

Colour has been investigated and used for more than 2000 years, throughout history. Many different civilizations have experimented, have learned and have used colour. We are still learning today about how colour affects us and its importance in our lives. The ancient Egyptians have been recorded to have been using colour for cures and ailments. They worshiped the Sun, knowing that without light there can be no life. They looked at nature and copied it in many aspects of their lives. The floors of their temples were often green – as the grass which then grew alongside their river, the Nile. Blue was a very important colour to the Egyptians too; the colour of the sky. They built temples for healing and used gems (crystals) through which the sunlight shone. They would have different rooms for different colours.

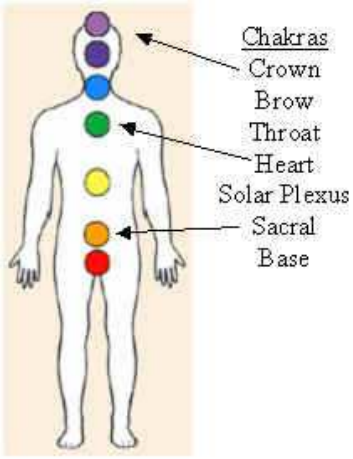
We would perhaps relate our present method of colour/light therapy to this ancient practice.

There are lists on papyrus dating back to 1550 BC of colour "cures". Their deep knowledge and understanding powers of the colour rays was so nearly lost when, later on in history, the Greeks considered colour only as a science. Some persons, among others, abandoned the metaphysical side of colour, concentrating only on the scientific aspect. Fortunately, despite this, the knowledge and philosophy of colour was handed down through the ages by a few.

The Chinese also apparently practiced colour healing. The Nei/Ching, 2000 years old, records colour diagnoses

COLOUR THERAPHY

Colour therapy is not an alternative but an aid to modern medicine through the centuries. The Chakras of the body are areas which are thought to be affected by that particular colour.



The Neuro-peptides produced by light stimulation have many physiological effects within the body. it therefore follows that different colours produce different emotions but also it should be noted that excess of a certain neuro-peptide can lead to unwanted disease. A depressive medical disorder which is successfully treated by colour therapy is S.A.D.s, or Seasonally Affective Disorder. This occurs in the winter and is due to a reduced ability to absorb light. For sufferers, a good way to combat the disorder is to reduce the amount of blue in the surroundings as this is a cool, tranquillizing colour.

We need to expand our awareness of colour so that we can truly benefit from nature's gifts so that 'colour' becomes a way of life, not just a therapy.

THE COLOUR OF OBJECTS

The colour of an object depends on both the physics of the objects in its environment and the characteristics of the perceiving eye and brain. Physically, objects can be said to have the colour of the light leaving their surfaces, which normally depends on the spectrum of the incident illumination and the reflectance properties of the surface, as well as potentially on the angles of illumination and viewing. Some objects not only reflect light, but also transmit light or emit light themselves, which also contribute to the colour. A viewer's perception of the object's color depends not only on the spectrum of the light leaving its surface, but also on a host of contextual cues, so that colour differences between objects can be discerned mostly independent of the lighting spectrum, viewing angle, etc. This effect is known as colour constancy.

THE CROMATIC COLOUR WHEEL

Colours can be very powerful. They stir up our emotions, covey personal and cultural messages and set the mood. A bright red can shout "stop" while a deep blue can be calming and quiet.

While individual colour say a lot on their own, most of what we see in the world involves more than one colour. The way those colours work together is called Colour Harmony. Some colours look great together, and others clash dramatically. The knowledge and understanding basic colour theory can help bring a little structure to the colour choosing process and lead to more harmonious colours.

The chromatic colour wheel

Primary colours

Secondary colours

Tertiary colours

The chromatic colour circle or wheel is an illustrative organization of colour hues in a circle that shoes relationships. It explains fundamentally the colourfulness, Chroma, purity, or saturation: how 'intense' or 'concentrated' a colour is. Technical definitions distinguish between colourfulness, Chroma, and saturation as distinct perceptual attributes and include purity as a physical quantity. (Wiley, Chichester (2005); CIE Pub. 17-4, International Lighting Vocabulary 1987; Bems (2001).
Colour wheels can help us to choose colours that work together well. We can analyze the positions of different colours on the colour circle to predict and describe the effect colours have together. There are an

infinite number of combinations that work but here are a few basic examples: Primary colours, Secondary colours, Tertiary et cetera.

Analogous colours are next to each other on the colour wheel. If you want your blog to have a calm, comfortable feel to it, choosing analogous colours is a great starting point.

Analogous colours

Complementary colours are opposite to each other on the colour wheel. Complementary colours are very high-contrast and active. They will often create a visual 'buzz' when paired with each other.

Complementary colours

If they are carefully put to use in practice, they can do a good job of conveying vibrancy and excitement. However, it's worth noting that using complementary colours for text will usually make things pretty tough to read.

Split-complementary colours schemes involves two colours that are near- analogous paired with a complementary colour. Split-complementary palettes end up with the best of both worlds! They have a great sense of balance and harmony along with some vibrancy thrown in.

Split-complementary colours

Imperative ideas: A good thing to keep in mind is that these basic steps are starting points. Once you have colours you like, you can tweak the exact hues, tints, and shades to your liking. The best way to choose colour is just to experiment. While the chromatic colour circle or wheel can help inform colour relationships. (http://dailypost.wordpress.com (2015) principles of Design: Colour Harmony.

PIGMENTING THE POLYTECHNIC ENVIRONMENT

The Polytechnic environment is built primarily for learning. The area accommodates structures for residence, (Staff quarters and hostels for students) Workshops, lecture halls, Libraries and a few number of established business premises, for example, banks. Over ninety percent of the entire area is busy with studying and learning activities.

OBSERVATIONS

1. There are no demarcations in terms of the colour palette between the staff quarters, hostels and workshops; laboratories and Libraries, theatre and lecture halls.
2. Almost all the structures, academic and non-academic areas have their interior and exterior wall surfaces carrying the same colours.
3. The roofing materials of the Federal Polytechnic buildings carry such colours as red, green, in their full saturation. It should be noted that darker colours absorb heat while lighter colours reflect light.
4. Roofs with deep blues, greens, reds, browns etc absorbs heat in the day and transmit it through the roofing members to the walls. At Sunset the interior part of the building is laden with emitted heat from the walls and consequently the atmosphere outside the building becomes more conducive than the room apartments.

5. The Polytechnic buildings carry predominantly such colours as red, green and Creams in their full strength.

CONCLUSION

Certain pairs of colour combinations show up more clearly than others. Black on yellow, green on white, blue on white black on white and black on white are good examples, but if the order is reversed the sharpness or contrast is not so apparent, effects which are well known to sign writers.

Combinations of very similar hues can be disturbing. Harmony can usually be secured if the colours follow the natural order of progression from light to dark, of which there are two spheres, a red and a green. The first goes from yellow the lightest through yellow, orange, orange- red, red, red-purple to purple the darkest. The second from yellow through yellow-green, green, blue-green, blue, blue-purple. Thus, if yellow and blue-green are used together, the yellow should be the lighter of the two. If this natural order of colour is reversed, then the result will be discordant. When a colour is changed by the colour alongside it, this can be remedied by adding to the changed colour some of the colour causing the change.

From the ongoing discussion of the above subject matter, observations and Contributions from relevant authorities, it could be safe to assert that the Federal Polytechnic, Idah environment is aesthetically poor. The predominant red, green and cream yellow which we can see in almost all the buildings are monotonously repeated on roofs, internal and external wall surfaces of the building structures.

When colours are not properly applied, it is not only going to dampen exciteful emotions, reduce productivity, but dangerous to the health of the users.

This study therefore proffer the 'chromatic colour wheel as a tool to use in building our environment for the Nation' Sustainable Growth.

References

Berlin, B. and Kay P. (1969), - *Basic colour Terms: their Universality and Evolution*, Berkeley: University of California Press.

Berns,R.S.(2001). Principles of Colour Technology (http://www.wiley.com/WileyCDA/WileyTitle/ProductCd-047119459X.html), 3rd Ed., New York

Chichester (2005). The principle of design: colour harmony/

CIE Publication 17-4, International Lighting Vocabulary (http://www.cie.co.at/publ/abst/17-4-89.html), 1987.

Colour Therapy (www.colourtherapyhealing.com)

Craig F. Bohren (2006) *Fundamentals of Atmospheric Radiation: An Introduction with 400 problems* (http://books.google.com)

Fairchild, M.D. *colour Appearance Models*

Hermann Von Helmholtz, *physiological optics – The sensations of vision*, 1866, as translated in sources of colour science, David L. Mac Adam, ed., Cambridge: MIP Press, 1970.

Painting and Decoration; An Information Manual – Filcher et al (1981).

The Daily post (2015) – http://dailypost.wordpress.com.

Tubb, L. F. J. (1979) *Painting and Decorating*

Uzoagba – (1982) Understanding Art.

Waldman, Gary (2002). *Introduction to light: the physics of light, vision and colour* (http://books.google.co.uk).

(http://www.willey.com/willeyCDA/wileyTitle/productCD-0470012161.html), 2nd Ed.,