A STUDY TO DETERMINE THE COLOR PREFERENCES OF SCHOOL CHILDREN

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by

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ACKNOWLEDGMENT

This thesis is affectionately dedicated to all young children who bring happy and harmonious concepts of color and of life to a less articulate adult world and especially remembered are the 1007 young pupils of the Tucson Public Schools whose responses make this study.

Many persons have helped the author set up and carry through this study. Especial acknowledgment is due Dr. O. K. Garretson, Dean of the College of Education; Dr. Herman Roemmich, Director of the thesis; Mr. Andreas S. Anderson, Head of the Art Department; and to Mr. Robert D. Morrow, Superintendent of the Tucson Public Schools; to Miss Alice Fulmer, Mrs. Phyllis Logan, and Mr. Jonathan Booth, Supervisors of Elementary Education in the Tucson Public Schools, for making possible the administrative cooperation of all concerned; and to Mrs. Laura Ganoung and Mr. Joe Young for helpful suggestions.

No less thanks are due to all the very patient principals and thirty-six cooperative and interested teachers who helped with the study in the C. E. Rose, Government Heights, Dunbar, Ochoa, Blenman, and El Rio Elementary Schools in Tucson. The author claims sole responsibility for any omissions and errors that may appear and is well aware that much remains to be done in this most interesting field.

Tucson,

26, May, 1951.

CHAPTER I

INTRODUCTION

The Nature of Color

The existence of color[1] on earth is co-existent with the evolution of the world.[2] The relationship of color and the earth is that well integrated that one is dependent in some measure upon the other. Color is dependent on light.[3]

The sun is the source of most of our light.[4] The refraction of the energy waves emitted by sunlight, our principal light source, convincingly demonstrates the presence of all visibly known colors in sunlight. If sunlight is the source of most of our light and sunlight contains all known colors, then sunlight is the source of all practical colors.

The sun expresses itself in terms of wave lengths of energy waves of high and low intensity. In turn, energy expresses its components in terms of: wave lengths of light

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[1] Color, throughout this thesis, will be known and defined the same whether spelled color or colour.

[2] Sir William Bragg, The Universe of Light, pp.1-5. New York: MacMillan Co., 1933.

[3] Ibid., pp. 6f.

[4] Erwin Freundlich, The Foundations of Einstein's Theory of Gravitation, pp. 69-92. New York: E. P. Dutton and Co., 1919.

manifested in terms of visibility; these visible light rays include all visible colors of the spectrum ranging through red, orange, yellow, green, blue and violet, as seen in the rainbow, a natural expression of the complete color spectra. Red marks the lower limits of the wave length of light visible to human eyes and red-violet marks the upper limitations of the color of visible light.

In the area, on the light-energy continuum, apart from the range of visible light there are energy waves transmuted to heat, energy waves used as x-rays, energy waves transformed to radio use, energy waves that carry the sensation of sound, and many unknown areas and qualities of light-energy among which are those called cosmic rays. "Light has velocity which is the same for all wave lengths in free space and varies otherwise with the wave length and the nature of the medium through which the light is passing."[1]

Color acts as a sensation to our eyes. Our eyes are equipped to perform best in that light of a limited range of wave lengths expressed in terms of the color spectrum. To illustrate the limitations: it is known that certain animals have a wider range of sensibilities than have humans. The cat responds to the demands of a light environment that would completely frustrate humans. The cat sees very well in the dark by the automatic adjustment of its delicate eye

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[1]Bragg, op. cit., p. 89.

equipment. The dog can hear sounds, carried by light energy waves, of a range beyond the sensitivity of human ears. It is suggested that it may be possible for animals to receive color wave-energy sensations not admissible to human eyes.

> The nature of a ray of light is, therefore, specified completely, so far as the eye is concerned, when its intensity and its wave-length are defined. If the ray is complex, consisting of a mixture of rays of differing wave-lenghts, it is further necessary to state the intensity of each component: but that is all. There is indeed an infinite additional complexity of our colour sensations which is due, not to variations in the quality of light itself, but to variations in the reactions of eye and brain. The former must be distinguished from the latter.[1]

The relative influence of color has been measured well and intensively in many areas; specifically, physics, botany, zoology, chemistry, archaeology, and anthropology. It is only recently that the same scientific study has been applied to the psychological analysis of color in its relation to present day homo sapiens as has so adequately been applied to the lower forms of life: the study of the relationship of color to the behavior of the organism.

The specialized human organs have been minutely dissected and analyzed. Careful note has been taken of the

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[1]Bragg, op. cit., p. 89.

color receptors of the human eye.[1] Infinitesimal scientific measurements have been recorded of the potentialities of the rods and the cones of the eye that afford the human being the pleasures of the spectrum of color available to human sight.

Blood has also received its share of attention with regard to perceptual changes in color during certain behavioral adaptations to environment.[2]

The genetic possibilities of color combinations of such things as human hair has engrossed biologists and anthropologists for centuries. Geographical determiners of

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[1]Neil R. Bartlett, "Vision," Annual Review of Psychology, Vol. 1, 1950. p. 31 ff.

Cameron and Steele, "The Poggendorff Illusion," Psych. Review, Mon. Sup. 1905, pp. 83-111.

Heinrich, "On Monocular Visual Space," Brit. Jour. Psychol., 1909, 3, pp. 66-74.

Holt, "Eye Movements During Dizziness," Harvard Psychol. Studies, 1906, 2, pp. 67-73.

Hunter, "The After Effects of Visual Motion," Psychol. Rev., 1914, 21, pp. 245-277.

Thelin, "Perception of Relative Visual Motion," Jour. Exper. Psychol., 1927, 10, pp. 321-349.

Van Waters, "Visual Perception of Horizontal Movement," Jour. Exper. Psych., 1934, 17, pp. 223-245.

Wohlegemuth, "On the After Effect of Seen Movement," Brit. Jour. Psych., Mon. Sup., 1911, 1, pp. 1-117.

[2]Mark Sexson, The Power of Color, Boston: The Christopher Pub. House, 1948.

Faber Birren, The Story of Color, pp. 194-196, Westport, Conn.: The Crimson Press, 1941.

hair and eye and skin pigments have been the subject of thousands of articles directed at specialized physicists,[1] zoologists,[2] botanists,[3] chemists,[4] archaeologists,[5] anthropoligists,[6] medical technicians,[7] beauty consultants,[8] agricultural economists, and politicians; why have educators not profited more from these part-of-the-whole studies?

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[1] C. Villalobos Dominquez, Investigation on Impure Spectra and Its Consequences for the Theory of Colors, Buenos Aires: Ruiz Hnos, Venezuela 529, 1931.

Frank Allen, "On Reflex Visual Sensations," Am. Jour. Phys. Optics, Vol. V., No. 4, 1924.

M. E. Chevreul, The Laws of Contrast of Colour, p. 28. London: Henry G. Bohn, 1860.

Rood, Modern Chromatics, p. 30 ff., 1879.

Bancroft, Experimental Researches Concerning the Philosophy of Permanent Colors. (See Moerz:) Dictionary of Color.

[2] R. Ridgway, A Nomenclature of Colors for Naturalists, Boston: 1886.

[3] A. A. Crozier, A Dictionary of Botanical Terms, New York: 1892.

[4] W. Linton, Ancient and Modern Colours, London 1852.
J. Napier, A Manual of Dyeing and Dyeing Receipts, London: third edition, 1875.

[5] D. R. Hay, A Nomenclature of Colors, London 1846.
A. G. Werner, Nomenclature of Colours, London 1814.

[6] T. H. Croker, T. Williams, and S. Clark, The Complete Dictionary of Arts and Sciences, London: 1766.

Emory S. Bogardus, "Measuring Changes in Ethnic Reactions," Amer. Sociolog. Rev., Vol. 16, No. 1, Feb. 1951, Albany, New York: Amer. Sociolog. Soc.

[7] W. B. Cannan, Bodily Changes in Pain, Hunger, Fear, and Rage, New York: D. Appleton and Co., 1915.

P. Bard, "On Emotional Expression After Decor-

These part-of-the-whole investigations have been relevant to the more efficient functioning, teaching, and administrating of our democratic educational systems and the essential value has not been unrecognized. It has taken time to prepare a philosophical background upon which an effective educational psychology may work. The philosophy of the American system of education has evolved into a democratically progressive educational system. Under such a system a sound psychology of color has more importance than under an autocratic system, where individual difference is of small consequence. Under a democratic educational system individual difference enjoys the development of all potentials profitable to the individual. Under an autocratic educational system individual possibilities, including attitudes and interests cogent to the healthy color psychology of separate members of the society, are submerged and inhibited. "However, the fullest development of each individual's intrinsic potentialities, is still a compelling American ideal. The preservation of variety in teach- methods, in materials, and in educational procedure appears to be our best assurance to preserve this ideal".[1]

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[7]tication With Some Remarks on Theoretical Views", pp. 309-329, Psychol. Rev., Vol. 41, 1934.

[8]C. Kirkpatrick, and J. Cotton, "Physical Attractiveness, Age, and Marital Adjustment," Notes on Research and Teaching, Amer. Sociolog. Rev., Vol. 16, No. 1, Feb. 1951, Albany, New York: Amer. Sociolog. Soc.

[1]Dale B. Harris, "How Children Learn Interests and Attitudes", p. 150, Forty-ninth Yearbook of the National Society for the Study of Education, Part I, Learning and Instruction, Chicago: 1950.

Part of the American ideal is the universal development of individual ability to express one's interests, attitudes and emotions in a way that is consonant with hygienic practices.

Expression begins with gross muscular activity in the very young. Children somewhat older express themselves with more coherent and more co-ordinate muscular gestures, sometimes involving noise. Vocal noises are used alone as an expressive force. Then comes a period before verbal development in which form, mass, line, and color are the material with which expression is achieved. However active verbal expression may become, visual need is by far greater; the eyes endure all the waking hours with little or no fatigue, due to the presence of color in our world.

> Color gives the eye a grip, so to speak, on shape, preventing its slipping off; we can look much longer at a colored object than an uncolored; and the coloring of architecture enables us to realize its details and its ensemble much quicker and more easily. For the same reason colored objects always feel more familiar than uncolored ones, and the latter seem always to remain in a way strange and external; so that children, in coloring their picture-books, are probably actuated not so much by the sensuous pleasure of color as such, as by a desire to bring the objects represented into a closer and, so to speak, warmer relation with themselves.[1]

The relationship of the bee to the blossom is anala-

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[1]Vernon Lee and C. Anstruther-Thomson, Beauty and Ugliness, p. 203, London: Lane.

gous in point: the blossom has color to attract the polinating insect. Nature has been wise in her application of color psychology to the blossoming plants and pollinating fauna; color is arranged to secure a behavior on the part of both that is mutually conducive to a naturally profitable relationship. The greater the need for pollination the greater the intensity of the applied color to the blossom; in the case of the cereus and other night blooming plants, white is the color selected to attract; it has the greatest light intensity at night. Odor reinforces the appeal of color in approximately the same ratio of necessity and so a particular color comes to have odor associations that are in turn partly responsible for the attitude on the part of the insect toward any particular color. The educational implications are so obvious, that it would be needless to dwell longer on the development of this point.

Adults who have always taken perfect eyesight for granted little remember and seldom appreciate the role of color in a world in which a child is trying to find his way. Helen Keller, a sensitive adult, though both blind and deaf from birth leaves us a description of color that enhances our insight into the power of color in an insecure world.

> I understand how scarlet can differ from crimson because I know that the smell of an orange is not the smell of a grapefruit. I can also conceive that colors shade and guess what shades are. In smell and taste there are varieties not broad enough to be fundamental; so I call them shades. There are half a dozen roses near

> me. They all have the unmistakable rose scent; yet my nose tells me that they are not the same. The American Beauty is distinct from the Jacqueminot and LaFrance. Odors in certain grasses fade as really to my senses as certain colors do to yours in the sun....I make use of analogies like these to enlarge my conceptions of colors....the force of association drives me to say that white is exalted and pure, green is exuberant, red suggests love or shame or strength. Without the odor or its equivalent, life to me would be dark, barren, a vast blackness.
>
> Thus, through an inner law of completeness my thoughts are not permitted to remain colorless. It strains my mind to separate color and sound from objects. Since my education began I have always had things described to me with their colors and sounds by one with keen senses and a fine feeling for the significant. Therefore, I habitually think of things as colored and resonant. Habit accounts for part. The soul accounts for another part. The brain with its five-sensed construction asserts its right and accounts for the rest. Inclusive of all, the unity of the world demands that color be kept in it whether I have cognizance of it or not. Rather than be shut out, I take part in it by discussing it, happy in the happiness of those near me who gaze at the lovely hues of the sunset or the rainbow.[1]

An awareness of color is the earliest visual experience of a child. Color becomes increasingly important and color associations with pleasure or pain begin the determinance of life long attitudes towards people, things, and ideas.

There are very few psychological facts about the child's use of color at different ages that are scientifically dependable.

We are not always sure that an adult's catagorical name for a color parallels that of the childs.

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[1]Helen Keller, The World I Live In, pp. 105 ff., The Century Co.

Due to the growing complexity of societal configurations and the growing use of color in symbolistic directing; we cannot be at all certain of a constancy of understanding on the part of the child toward the adult's use of color. There may be logical or illogical shifts in color attitudes of children as they mature. Children may inherit color tendencies as they inherit politics, or they may inherit color behavior as certainly as they inherit the color of their eyes or their hair.

If educators had some of the answers to these educationally implicative queries on the color psychology of the child the teacher of the future might be better prepared to confidently face a career in teaching with certain knowledge of individual mental, and group progress for all participants.

Certainly if an individual's color preference or antipathy were known; educational guidance would be relatively an easier task.

Some future day it may come about that the color preferences, and the color dislikes of every child may be filed in the accumulative record and there recorded along with the data that are there now; such as the color of his skin.

The nature of color has been examined for the benefit of both reader and investigator: an acquaintance with the facts has been known to aid understanding. An acquaintance with some of the facts of color has proven the scope of this subject to be enormous. The total problem of color cannot be

quickly followed and easily understood within the space of a single written thesis. However the concept of color and its psychology can be delimited to basic fundamentals and the search narrowed to this: the essential nature of color in its relationship to the perpetuation and growth of the human body and mind. Since color and the child possess a mutually reinforcing integration determined by existant conditions of life; the partial inspection of this relationship has yielded many isolated facts and understandings; but, of the relation of these especial magnifications to the whole field of educational color psychology, very little integrated knowledge has been discovered and revealed to those who seek the answers to the oft-misunderstood area of child behavior: educational color psychology. Some people have been content with this state of affairs within educational concepts; others have been oblivious; and then there have always been those, who, though admitting to the ability to lead, guide, and teach the child, when confronted with this problem of the relation of the parts to the whole, have repeatedly applied assumptive solutions, many of which are contradictory.

The present study has attempted to gather facts concerning the child's color preferences. By so doing, an objective sense of reality, to present psychological conditions, within the milieu of the school, has contributed to the scientific scrutiny of the point of reference: the color psychology of school-age children. It has been the intent of this

inquiry to diagnose the problem of color behavior through the study and dissection of measurable manifestations. The frame of reference is color; the point of reference: the behavior of the child. A measurable manifestation of color behavior; color preference, concurs with a principle of learning; namely that the experience, which proves to be pleasurable, tends to repeat itself. The explanation of the particularly pleasurable circumstance may or may not be one of a socially desirable nature, depending on the motivation that prompted the response.[1]

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[1]Gordon W. Allport, Handbook of Social Psychology, pp. 698-844. Worcester, Massachusetts: Clark University Press, 1935.

CHAPTER II

Background for the Study

It was necessary to stabilize and pinpoint the salient facts of a shifting background of color studies that had a relative bearing on the problem. The problem was that of securing objective evidence of the color psychology of school-age children.

The selection of the problem; the color preferences of school children was partially influenced by the recognition of Thorndike's "Law of Effect,"[1] as well as the necessity to clarify and eliminate basic assumptions on the part of educators as to the role of color in the life of the child.

The written evidence offered concerning objective inquiry into the past of color psychology is not as vast as the archives of other recorded endeavors relative to the progress of man. Color coincided with the reality of man's every-day world. He liked color. Color impressed him with his own status in the world. He used color to bring himself in closer reality with his environment, and as a force to help control internal and external pressures.

But like other things of value and power dominated by

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[1] E. L. Thorndike, The Psychology of Wants, Interests, and Attitudes, New York: D. Appleton-Century Co., 1935.

the insecurity of man, color of controllable dimensions, within the power of man, became the special province of superstition, religion, magic, philosophy, and art. The divisions of authority, religious and secular, controlled the psychology of color by acceptance and rejection formulas. The pyramiding ratio of man's reproduction multiplied as well the scope of control of color psychology, by the arbitrary formulas.

It was not until scientific inquiry came into conflict with authority in the course of scientific investigation that the arbitrary formulas of color psychology began to break down, and the jealously guarded color secrets of artists began to be exposed. Sometimes these artists had the status of magicians. They used authority, fear, war, and religion to gain prestige, wealth, and honor for themselves; for the artist could rise only under the patronage of one or the other of the conflicting authorities, the religious or the secular. The artist was part of the formula of the authorities; except for an occasional rebellious individual, the artist depended on the patronage of authority and conformed to such formulas as were deemed wise by existing authority.

Seldom, as in the case of Leonardo da Vinci, was the artist also philosopher and scientist.[1] Though many artists had risen to ranks of authority, power, and prestige, da Vinci

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[1]S. Bhagavantam, Misc., Ramchandra Deo Professor of Physics, Andhra University, Waltair, Scattering of Light and the Roman Effect, Brooklyn, N.Y.: Chemical Publishing Co., 1942, 1st American Edition.

was one of those whose wisdom survived the scrutiny of philosophic and scientific light; Leonardo da Vinci defined the realm of color within the reality of life itself.

> As Leonardo da Vinci discovered, the human nature of color differs from its nature as light substance. This truth, revealed by him in the fifteenth century, was to be forgotten until men like Boyle and Newton were to come forth with strange doctrines to upset the notions of the mighty Aristotle. Color was to be taken apart and laid naked on the laboratory table. Theorists concerned with sensation, beauty, and art were to witness all this; use laws of physics to wrong purpose, become miserably confused, and run off wildly in weird tangents of irrelevance.
>
> But in the end the color art was to be rescued from the laboratory, restored by the psychologist to its rightful parent, and treated with sympathetic understanding.[1]

Meanwhile custom had defined certain taboos and usages of color.[2] Chart I on page 21 demonstrates the symbolism of color derived from superstitious custom and religious usage. The recorded philosophies and superstitions of color found their way into education by an unobjective appeal from the past; by the weight of authority founded on the historical past; by attitudes, understandings, and knowledges engendered by the chronological past, and prompted by man's desire for security fulfillment by passing past culture into the future. Many of these recordings were penned by theological philosophers,[3] historians, authorities, and educators. Other recordings are still to be seen on archaeological finds: buildings, tombs, cultural artifacts, and works of art.

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[1] Birren, op. cit., pp. 206 f.

[2] Birren, op. cit., p. 47.

[3] Birren, op. cit., pp. 58-74.

CHART I

Symbolism of Colors

White.....	Diamond, the color worn by Christ, by women as emblem of chastity, by rich men to indicate humility.
Red.....	Ruby, the color to designate royalty, fire, creative power, heat.
Blue.....	Sapphire, the color of truth, heavenly love, constancy and fidelity.
Green.....	Emerald, is the color of spring, hope and victory.
Yellow.....	Gold, signifies the sun, marriage and fruitfulness. The opposite interpretation is of dirty yellow: the color of Judas, jealousy, deceit.
Violet.....	Amethyst, is the color that stands for passion and suffering.
Gray.....	Is for penance, humility, mourning, accused innocence.
Black.....	Has opposing significances; it can be the color of murder, death, mourning, the storm; it was also sometimes worn by Jesus.[1]

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[1] C. E. Clement, Handbook of Legendary Art, 22nd edition, Boston: Houghton Mifflin and Co., 1890.

The symbolism of colors to indicate the four points of the compass, as used by various primitive peoples, has been tabulated in Chart II, page 23. The primary colors, plus white and black, predominated in almost every case. The similarities that existed between widely separated peoples may have been pure coincidence, or may have been due to the availability of materials. The possibility seems likely that these peoples at one time had a common heritage.

The elements have been symbolized by the Hindu, Greek, Chinese, Josephus, and da Vinci. The primary colors have again been called upon to signify that which had significance of power, or magic: earth, water, fire, air, wood, and metal. Chart III on page 24 tells the story.

The signs of the zodiac played an important part in the lives of the ancients. This importance has carried over to the modern world. The days of the week were named to correspond to a planet; color symbolism was used to link the planet closer to the name of the day: moon and Monday, brought into closer association by the color white. Chart IV, page 25, lists seven multiple associations of color symbolism based on planetary derivation.

Color is still working symbolically for the world today. Modern color symbolism is extremely important to the efficient functioning of transportation. The Railroad Code has used red, yellow, green, blue, and purple to signal correct procedure by train and maintenance crews. In Chart V, page 26, the reader will find the symbolisms of the colors in the Railroad Code.

CHART II

Symbolism of Directional Colors in Different Countries

	North	South	East	West
China.....	black	red	green	white
Ireland.....	black	white	purple	dun[illegible]
Tibet.....	yellow	blue	white	red
Navaho Indian.....	black	blue	white	yellow
Yucatan.....	white	yellow	red	black
Hopi.....	yellow	red	white	blue
Zuni.....	yellow	red	white	blue
Apache.....	blue	white	black	yellow
Cherokee.....	blue	white	red	black
Chippewa.....	black	green	red	white
Creek.....	red and yellow	blue	white	black
Pueblo.....	white	blue	red	yellow[1]

[1]Birren, op. cit., p. 22.

CHART III

Symbolism of Colors
of the Elements

	Earth	Water	Fire	Air	Wood	Metal
Hindu.....	black	white	red			
Greek.....	blue	green	red	yellow		
Chinese.....	yellow	black	red		green	white
Josephus.....	white	purple	red	yellow		
da Vinci.....	yellow	green	red	blue[1]		

[1]Birren, op. cit., p. 26.

CHART IV

Symbolism of Colors

The Hues of the Planets

Planet	Day	Temple of Nebuchadnezzar	Ancient Color	Modern Color
Sun	Sunday	yellow	yellow or gold	orange
Moon	Monday	white	white or silver	violet
Mars	Tuesday	red	red	red
Mercury	Wednesday	blue	neutral	yellow
Jupiter	Thursday	orange	blue	indigo
Venus	Friday	green	green	blue
Saturn	Saturday	black	black	green[1]

[1]Birren, op. cit., p. 30.

CHART V

Symbolism of Color in the Railroad Code

Red.....Danger, stop

Yellow.....Proceed with caution

Green.....All clear

Blue.....Caution, men working

Purple.....Stop[1]

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[1]A. G. Abbott, The Color of Life, p. 255, New York: McGraw-Hill Book Co., 1947.

The listing of Spanish color terms, as well as English, warranted the inclusion of Chart VI, page 28, "Color Names in Foreign Languages," in any thesis to do with color especially if that thesis might be of interest to art teachers in Southern Arizona. The large percentage of Spanish-speaking school children makes it imperative that art teachers be familiar with Spanish color terms.

The color symbolism of the past is gradually giving way to the objective evaluation of the color symbolism of the future. The departure of the old can be hastened along with the development of the new in our school systems by the consideration of color psychology, whenever allegiance is paid to the needs of children, particularly in the consideration of individual differences.[1]

> Color is not an end in itself. If color is to be used at all in the plant, it must be used with purpose....Factory decoration is not interior decoration in any sense of the word. In principle, one does not get people to work harder and more accurately by inspiring them with color. Quite the contrary, the trick is to establish a seeing condition that automatically, in and of itself, makes the task easier. In other words, color does not stand around on the sidelines like a cheerleader. It digs in with the worker's own problems of seeing, directing his attention rather than competing for it. It is integral with production and not a thing apart.[2]

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[1]Polly Ames, "Children and the Teaching of Painting," Progressive Education, pp. 535-42, XVI, 1939.

[2]Faber Birren, "Color in the Plant," Factory Management and Maintenance, Vol. 103, No. 2, Feb. 1945.

CHART VI

Color Names in Foreign Languages

English	French	German	Italian	Spanish
Red	Rouge	Rot	Rosso	Rojo
Orange	Orange	Orange	Arancio	Naranja
Yellow	Jaune	Gelb	Giallo	Amarilla
Green	Vert	Grun	Verde	Verde
Blue	Bleu	Blau	Azzurro	Azul
Violet	Violet	Veilchenblau	Violetto	Violeta
White	Blanc	Weiss	Bianco	Blanco
Gray	Gris	Grau	Grigio	Gris
Black	Noir	Schwarz	Nero	Negro[1]

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[1] A. Maerz and M. R. Paul, Dictionary of Color, New York: McGraw-Hill Book Co., 1930. pp. 18-19.

> Improved as elementary schools now are in allowing freedom for children's spontaneous, natural expression, much room for improvement remains if the next generation of adults is to be more truly "adult" aesthetically. Making the child afraid to try an original painting by insisting that it be as good as the pattern or ridiculing a naive childish comment in the interpretation of a poem are not only crushing blows to the child's personality but also stone-wall barriers to further aesthetic expression and development. Aesthetic production, reproduction, and enjoyment demand freedom of response. We must help children keep the free spontaneity of early childhood if their aesthetic experiences are to be stepping stones to further growth.[1]

If "education" accepts the responsibility for the correction of disoriented color psychology that reflects its distortions many ways: inability to learn to think, to read, to use arithmetic symbols, and to write, then "education" must scientifically review all of its fundamentals. This statement is made, not with an unawareness of current efforts in this direction, but as an urgent appeal to a further integration of specialized area studies into the whole relativity of a realistic education.

> Thus, aesthetic responsiveness must not be considered as an isolated process, unrelated to other personality traits and characteristics. On the contrary, it must be regarded as involving an organization or orientation of the personality. This, in effect, is what Mueller-Freinenfels had in mind when he insisted that the greatest inhibiting influence upon any kind of aesthetic responsiveness is an ac-

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[1]Esther J. Swenson, "Applications of Learning Principles to the Improvement of Teaching in the Early Elementary Grades," National Soc. for the Study of Education, 49th Yrbk., Part I.

> quired emotional stupidity and insensitivity and that guidance of this is one of the most important tasks of art education of every kind.[1]

Color is not always a cause; it is just as often an effect. Prejudicial color psychology, unrelated to the building up of an integrated social and individual effectiveness, can be a causation of a personality disorder, and result in mental illness; whereas disintegrated personalities many times reflect the nature of their disturbance by means of color preferences and rejections. This hypothesis has been recognized by H. W. Brosin and E. O. Fromm of the Rorschach Research Exchange, who have developed a theory of the recognition of color shock in neurotics.

Along the same vein there exists a perimetry test[2] developed by James E. Reeder, Jr. He has discovered through a study of "psychogenic" color fields neurotic tendencies previously unsuspected. The perimetry test measures the sensitivity of the eye to color. If the area of sensitivity is abnormally distributed over the retina, the human being so found is likely to be mentally abnormal. According to Reeder, the test cannot be faked. If this is true the field of educational psychology may someday be armed with a powerful measuring instrument.

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[1] Mueller-Freinenfels, Erziehung zur Kunst, Leipzig: Quelle and Meyer, 1925.

[2] Faber Birren, Color Psychology and Color Therapy. P. 118.

H. E. Read, a British investigator published a report in London in 1943 that attempts to establish a direct relationship between personality-type and type of art product. His American educational colleagues doubt the validity of Read's report, and as Mursell of Columbia has stated: "Our categories of personality classification are altogether too unstable to make it hopeful to interpret a child's drawings primarily in terms of the kind of person he is and to use this as the basis of his artistic education."[1] Mursell says later.

> We are dealing with a basic and definable type of human responsiveness, integrated with everything in the personality. Even if left entirely alone, its development will go forward to a certain point, but it is sure to be limited and almost sure to be distorted. The problem clearly is to shape up and facilitate this process in the light of our understanding of the basic aesthetic responsiveness itself.[2]

"Macomber has shown that a discriminating command of color relationships is far better achieved through a variety of projects requiring the use of color than through the conventional use of the color circle."[3] This investigator feels, in the case of Macomber's report, that it would have been better to have pointed out that often the means inadvertently

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[1] James L. Mursell, "How Children Learn Aesthetic Responses," National Soc. for the Study of Education, 49th Yrbk., Part I.

[2] Ibid.

[3] Ibid.

often becomes the end. The color circle sometimes can be used well as a means by which to clarify the understanding of color relationships; rather than becoming an end result of the teaching of color by unfortunate teachers who, having a poor concept of the reality[1] of color, teach emotional stupidity[2] and insensitivity to their impressionable charges.

Many sources of information exist concerning current studies in color psychology and its peripheral areas. The directive intent of the nature of the studies may be obtained by a brief perusal of the titles. Indeed, if educators are genuinely interested, it is imperative that they acquaint themselves with the most recent studies in this area, before this investigator can derive a bona fide purpose for his study, beyond that of personal gratification. If a genuine need is reflected in the minds and purposes of others, it will be assured that an additional contribution in this field will be welcomed by informed representatives of a democratic system of enlightened education.

Listed are some theses and dissertations underway, related to this investigator's field of educational color psychology.

Psychological Abstracts: January, 1951, vol. 25, no. 1, p. 972.

Casperson, Roland C., The Visual Discrimination of Geometric Forms. John Hopkins U., 1950, Ph. D.

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[1] Birren, "The Story of Color," op. cit., pp. 242 f.

[2] Mueller-Freinenfels, "Erziehung zur Kunst," op. cit.

Fonda, Charles P., The Nature and Meaning of the Rorschach White Space Response. John Hopkins U., 1950.

Phi Delta Kappan: Doctoral Dissertations, 1950-1951, p. 263.

Banks, Dwight S., "An Investigation of the Color Preferences of First-Grade Children." Boston, Kvaraceus.

David, Henry P., "Relationship of Picture Preference to Personality." Columbia, Shaffer, Lorge, Zucker.

Goldberg, Miriam, "Aspects of Projective Material Accepted and Rejected by Children." Columbia, Shaffer, Hobbs, Lorge, Zucker.

Swartz, Melvin, "The Role of Color in Influencing Responses to the Rorschach Test." New York. Ben-Avi.

Maginnis, Maria C., "A Study of Artistic Gestures in Children." California, (Los Angeles), Seagoe.

Flyer, Eli, "The Development of a Forced-Choice Projective Technique - The Picture Choice Test." Colorado, Fox.

Widdowson, Harry A., "The Development of the Picture-Choice Test as a Screening Device for College Students," Colorado, Fox.

Helmick, Russell, "A Survey of Educational Opinion and Attitudes Toward Television." Cincinnati, Hansen, Hendrickson, Paine.

Ibison, Richard Arthur, "Some Psychological Factors Influencing the Effectiveness of Textbook Illustrations." Indiana, Fox.

Roche, Gerald A., "Children's Preferences and Their Implications for Curriculum Improvement. Columbia, Mackenzie, Craig, Miel.

Fairchild, Mildred L., "Relationship of Art Specialists to Classroom Teachers in Improving the Educational Experiences of Children." Columbia, Ziegfeld, Foshay, Reid.

Freyberger, Ruth, "Significant Differences in the Creative Drawings of Children of Varying Ethnic and Socio-Economic Backgrounds Based on Samplings of Grades One Through Six in Pennsylvania." Penn. State, Lowenfeld.

LaCaff, Maurine, "Art Experiences and Interests of Arizona High School Girls," California, (Berkeley), Lund.

Thomas, Robert Murray, "Effects of Frustration on Children's Paintings," Stanford, McDaniel.

In briefly surveying the aforegoing list of current studies, a similarity of prepotent key words and meanings will impress themselves on the reader's understanding; discrimin-

ation, investigation, Rorschach, preference, children, color, projective, test experiences, and education. They are all significant with educational meaning but do they square with other cogent inquiries by older more tested examiners of this field? It was found that with advancing age an examiner tends to pursue a subject to a more complex level and, in general, is not as concerned with the educational implications of his study as are the newcomers to this particular area in education.

Some recent studies of more mature investigators.

Granit, Ragnar, (Karolinska Institutet, Stockholm, Sweden). "Physiology of Vision," Color Vision Annual Review of Physiology, 1950, 12, 485-502.

Hibben, Samuel G., "Effects of New Light Sources on Human Vision," Chicago: Arch, Ophthal., 1950, 43, 128-1134.

Stataper, F. J., "Age Norms of Refraction and Vision," Chicago: Arch. Ophthal., 1950, 43, 466-481.

Martindale, J. A., "Visual Inhibitions," Optom. Wkly., 1950, 41, 647, 649. Accomodative-convergence-dysfunction causes visual inhibitions to be called into use when attentive or near vision is in demand.

Boice, M. L., Tinker, M. L. and Patterson, D. G., Am. J. Psychol. 1948, 61, 520-26. In a study of color vision, Boice, Tinker and Paterson report a significantly greater incidence of color blindness in men over 60 years of age. Decreasing acuity with advancing age, in this and other senses, could be expected to contribute to progressively less adequate motor functioning.

Synolds, D. L., and Pronko, N. H., "Color Vision," Journal of Genetic Psychology, 1949, 74, 17-22. Using the Dvorine color perception charts, Synolds and Pronko found that the percentage of correct naming responses ranged from zero at age three to 25% at age four and above 90% after age seven. Marked improvement occurred between the fifth and sixth years.

J. B. Feldman writes in the American Journal of Ophthalometry (1950, 33, 777-785), on Vitamin A and calcium as

being at least partially responsible for certain color behavior.

One authority noted preference for simple colors among Mexican school children: red, yellow, green, blue, existed where there was calcium deficiency. When diets were corrected, color discrimination became finer and appreciation for more subtlety in color began to develop.[1]

There is a possibility, apparently, of the correction of some forms of color vision disorientation, by diet conditions. Teachers must become more adept at the recognition of the inhibiting effects of inadequate nourishment on color vision, in order to fulfill their responsibility to pupil needs and to individual differences. More important, they must constantly alert themselves against faulty interpretations of suspected causations.

The subject of color blindness encompasses that large a perimeter that it must be limited to its recognition of obvious reinforcement effects on this study. The United States Code has little to say on how color blindness may effect the citizens except as how it does effect the qualifications of an officer of a vessel or a pilot. Of course the various government services have a great deal to say about color blindness and its inhibiting effect on the action or behavior of its mem-

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[1]Birren, "Color Psychology and Color Therapy," op. cit. p. 117.

bers. "Men and animals, like plants, may be variously influenced by color in their life processes, their health, sickness, and well-being, whether or not the color is actually seen by them."[1]

Nursery rhymes have wormed their way into the earlier phases of the recognized educational color psychology of the young.

> There was a young lady in blue
> Who said, is it you? Is it you?
> When they said, yes it is
> She replied only, whizz
> That ungracious young lady in blue.
>
> There was a young person in green
> Who seldom was fit to be seen
> She wore a long shawl
> Over bonnet and all
> Which enveloped that person in green.[1]

Educators could be concerned as much with the attitudes that are being portrayed in children's legitimate books, as they are with their war on comic books. Many a thing that is said in jest and fun by an adult is sadly misinterpreted by children; such as the little boy in a Tucson nursery school who was reported to this investigator as having a fear of fire engines. He thought that firemen raced around on fire engines and started fires everywhere.

This investigator also collected from a nursery

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[1]Charlotte Steiner, The Big Laughing Book, New York: Grosset and Dunlap.

school the following spontaneus color nonsense rhymes.

White, white, go fly a kite
Red, red, wets his bed
- stays in bed
Yellow, yellow, wants a fellow
Green, green, you're a queen
Purple, purple, you're a durple
Brown, brown, you're a clown,
Black, black, sit on a tack [1]

The luckless child who is singled out for attack by his colleagues because of his color preference can be quickly led to submerge his preference in favor of a more popular choice. This quite naturally may structure an inner conflict that can lead to a personality disturbance.

> If we stop and ponder the matter, we realize that creative quality springs from some universal human disposition that is distilled differently by every individual. This creative quality derives in large part from the inner drives and feelings which underlie and are the dynamics of human behavior. Among two, three, and four year old children these drives and feelings tend to find relatively direct expression in overt behavior and are manifest in almost everything that children do. We should accordingly expect young children's paintings, which are a projection of creative quality, to reflect their inner lives in a very direct fashion.[2]

The above words were founded on a two year study of children under nursery school conditions. The validity of the results was checked by means of the Rorschach test, and

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[1] Joyce Sage: teacher at the Tucson Community School, 1951.

[2] Rose H. Alschuler and La Berta Weiss Hattwick, Painting and Personality, vol. 1, p. 3, Chicago: Univ. of Chicago Press, 1948.

the paragraph just quoted is an important distillation of the whole project which, incidentally, was conducted within the environs of Chicago. Accordingly, the present investigation, though being undertaken in Tucson, Arizona, is willing to assimilate and use all possible relative objective data, without respect to regional boundaries; more from the Alschuler report later.

Orientation into the nature of color was the content and purpose of chapter one. Chapter two has revealed a need of data in educational color psychology in which this investigator can make a small contribution. This contribution was defined by the demand for basic studies in color, as evidenced by the timely indications of the recent studies previously cited.

The present study of the color preferences of school children was framed by the sphere of existing data; objectivized by the relationship of this study to existing evidence; localized by time and space to Tucson, Arizona; and refined by a directive environment to this particular time and particular investigator.

Chapter three concerns itself with the method of procedure and how this technique was determined. Illustrations of some color preferences gathered from the Tucson Public Schools are to be found in chapter four.

An analysis and interpretation is presented in chapter five.

Chapter six presents a summary of the results of the study. Conclusions and recommendations refocus attention to the educational significance of data that survive the scientific scrutiny of this investigation.

CHAPTER III

Method of Procedure

The purposes of the two previous chapters, if achieved, have brought us to chapter three informed as to the nature of color, and cognizant of the character and scope of the background material.

The method of procedure must be defined before we attempt its use, discussion and evaluation. If this study is to possess meaning, relative to the understanding and pursuant to the purposes of interested persons, then the sequence of events and the use of materials necessitates logical organization and eloquent and coherent content. Assumptions are disruptive to any objective process and would be particularly so in the situation to be further developed. Though the special nature of a problem will help to define the delimitations of the procedure of solution; if feasible, it is scientifically wise to examine thoroughly the definition of terms in the light of contemporary studies of a similar nature in order to maintain relativity with reality.

> Statistics are a basis for action, and every survey therefore, has a purpose, namely, to get the answers to certain questions that will affect decisions

or provide increased knowledge.[1]

For objective clarity Deming's six important characteristics of a survey have been used to structure the method and procedure of this investigation into the color preferences of school children. It seemed justified to use this method because the study under consideration lends itself to a sampling survey as discussed by Deming.[2] The points he makes will be taken up in sequence.

Six important characteristics of a sampling survey.

1. Usefulness and comprehensiveness of content
2. Reliability of results, sufficient for the purpose
3. Intelligibility (classifications and definitions that are understood)
4. Speed
5. Economy of operation
6. Accurate interpretation and presentation[3]

Usefulness and Comprehensiveness of Content

A teacher that is fully aware of the color preferences of boys and girls in general, and her own group in particular, is that better prepared to lead each individual under her guidance to a more complete fulfillment of individual and

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[1]William Edwards Deming, Some Theory of Sampling, p. 4, New York: John Wiley and Sons, Inc., 1950.

Deming: Adviser in sampling, Bureau of the Budget, Washington. Adjunct Professor of Statistics Graduate School of Bus. Admin. N.Y.U.

[2]Ibid., p.2.

[3]Ibid., pp. 3-4.

group socially acceptable needs and practices. Therefore, a specific factor of the problem is to collect the data that will assist in the fulfillment of this purpose.

The method of the color preference statement used to gather the desired evidence.

A. After securing the attention of a class the occasion for the investigator's visit was stated by means of the reason above. The children agreed that a teacher so equipped would probably be a better teacher.

B. A box of crayola crayons, No. 16, and a 4" x 6" filing card were passed to each child in the class.

C. Instructions
   a. Place all cards on your desk blank side up - lined side down.
   b. Open your box of crayons
   c. Select your favorite color
      and/or the best color you can find in the box
      and/or the color you like the best
      (caution given against influence of neighbor's choice)
   d. With that crayon of the best color that you hold in your hand, draw a circle or a square. Do one or the other. Do not do both: a circle or a square,[1] any size, large or small, but do only one; the one you really like. Choose which you like best to do, a circle or a square, and then color it in with that same best crayon.

      (demonstrate on the blackboard)

   e. When finished, put that crayon away and turn the card over to the side with the lines
   f. Now pick out the color that you think is the ugliest that you can find in the box

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[1]Alschuler and Hattwick, op. cit., Vol.II, pp.448-459.

Arnold Gesell, Frances Ilg, and others. Infant and Child in the Culture of Today: Guidance and Development in Home and Nursery School. New York: Harper and Bros.,1943.

g. The boys will draw a capital B in the upper left-hand corner, (demonstrate) B stands for boys.
h. The girls will draw a capital G in the upper left-hand corner. G stands for girls.
i. What grade is this? (answer by pupils)
With the same ugly crayon, draw that number that stands for your grade beside the B or G.
j. With that same color that you do not like, at the top center of your card, (demonstrate), draw the number that stands for your age.

The color of hair and eyes of each child was also recorded, but since this thesis was limited specifically to the expression of color preferences by school children, other data not relevant to this thesis will not be presented. However, if this evidence should contribute to the clarification of some issue to be possibly developed in this thesis, such data will be used for that purpose only.

Reliability of Results, Sufficient for the Purpose

The reliability of results could be improved by the collection of the color preferences of the children in the companion grades in the same schools that were sampled, as most of the schools in Tucson have two classes in each grade. This would be equivalent to the improvement of reliability by the split-half method. Under the limitations of time allowed to complete this thesis, this could not be done.

It was first ascertained which color materials children were accustomed to use in school: crayola crayons no. 16,

by Binney and Smith,[1] New York, were the prevalent coloring materials. Therefore, boxes of the sixteen assorted colors, sufficient to equip each child in a class tested, were procured from an art supply store. This procedure standardized the color problem.

Intelligibility (Classifications and Definitions)

The definition of terms, because of its breadth of development, is deferred, to follow point six (vi).

Speed

The time required to test each class was estimated at twenty minutes. This proved to be a reliably average time for the thirty-six classes tested (grades one through six, in six public schools in the city of Tucson, Arizona). In the interests of time, organization and standardization, 4" x 6" filing cards were used, one to each child, to gather data. The test, or the method of obtaining preferences was simplified for various reasons: objectivity, intelligibility, speed, and economy of operation.

Economy of Operation

The logistics of the operation were planned to obtain the delimited data with the minimum of time, material and ex-

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[1]Binney and Smith: a letter written in reply to questions asked by this investigator, dated April 2, 1951. See appendix.

pense. Conference with public school administrators, superintendent, supervisors, and principals was helpful in economizing the time expenditure of all persons involved in the investigation, including the teachers, pupils and the investigator.

Accurate Interpretation and Presentation

The data obtained in this investigation has been presented by means of bar graphs as the results could be best presented in color. It would seem that in order to enable the reader to interpret the data accurately then the investigative evidence had to be clear and concise in its presentation. The bar graph in appropriate color offered the best opportunity to achieve this.

Definition of Terms

In chapter two the reader was given a preliminary contact with some of the on-going studies relevant to the character of the present investigation. If some of the significant words were remembered which, taken as a group, are briefly descriptive of the field of related study now under investigation, it will be recalled that such clues to testing and information gathering as discrimination, Rorschach, investigation, preference, children, color, projective, test, experiences, and education are important.

Funk and Wagnall's New "Standard" Dictionary of the English Language, New York: 1947, defines some of these words

extremely significant to the meaning of educational color psychology, and James Mark Baldwin's Dictionary of Philosophy and Psychology, New York: 1911, the MacMillan Co., three volumes, adequately illustrates the meaning of others, and sometimes Baldwin supplements the meaning of Funk and Wagnall's.

discrimination: (F and W) The fundamental act or faculty of intellect in noting differences and so preparing material for the higher and more complex forms of perception, conception, classification, etc.

(B) A judgment of difference between two or more objects, each of which is discerned from the total context of experience at the time.

investigation: (F and W) The act of investigating, careful inquiry or research.

(not in Baldwin)

preference: (F and W) The act of preferring; estimation of one thing above another; choice of one thing rather than another. Psych: the principle embracing secondary laws of association (law of preference.

(not in Baldwin)

projective: (F and W) derived by projection.

projection: A throwing, shooting or extending forth that which projects; a projecting part or object; a prominence.

(B) A stage in the genetic construction of objects antecedent to the conscious antithesis between subject and object; this meaning applies especially to the material of the consciousness of self.
The project is considered in contrast with subject and eject.

test: (B) A determination of the normal character of marks of an organ or process together with its functional efficiency.

The significance of the meaning of the key words that we have chosen to define in our study can be reinforced by further investigation into similar relevant studies. The various university theses abstracts have yielded some recent information. An examination of the university bulletins, theses, abstracts and related pamphlets have disclosed the following facts.

University of Arizona: 1945 and 1946
DeGrazia, Ted, Art and Its Relation to Music in Music Education. (relation of color to music)
Whitney, Lillian J., The Relation Between Expressed Interest in Certain Comic Strips and Significant Traits of Personality.

Tulane University: 1950
Mowbray, Jay Byron, Picture Interpretation in the Study of Attitudes.

Vanderbilt University: 1950
Barr, Thomas, A., Jr., An Optical Pyrometer for the Infra-Red Spectrum.

The University of Nebraska: 1949
Clifton, Donald, O., A Projective Technique to Determine Positive and Negative Attitudes Toward People.

Many exercised option II, no thesis.

Stanford University: 1949
Lang, Arch, D., The Integrative Process in Human Life and in Education.
Katz, Irwin, Emotional Expression in Failure: A New Hypothesis.

University of Pittsburgh: 1950
Goodman, Howard, W., An Experimental Investigation of the Affective Value of Color on the Rorschach Test.
Kipp, Orval: An Experimental Study of Color Perception.

Louisiana State University: 1948
Tinnin, Lynda, Claire, A Performance Test for Spastics.

The afore-mentioned studies are among the most recent attempts to find a solution or to contribute something worthwhile to the field of color psychology and its related areas. Amongst the titles and notations, can be recognized some of the key words that have previously been defined and observed. The implications within the titles seem to denote a modern development; the horizons of educational color psychology appear to be broadening within the meaning of education. The true nature of color as a vital force will be given proper recognition in the modern schools - if, the concept of color is clearly defined so that the meanings will encompass both the child's understanding and the teachers; rather than the two working at odds with opposing ideas and attitudes.

These theses and dissertations represent a type of American citizen on whom the future progress, of teaching, and the nation, depends. The inquiring mind is not to be found in only one state, as this chapter (III) has mentioned studies from widely diverse sections of the United States. A survey of the findings, conclusions and recommendations would direct the attention of educators and teachers to areas of high significance in the systems of learning:

DeGrazia; Color in Music in Music Education
Whitney; The Relation of Comic Strips and Personality
Mowbray; Picture Interpretation and Attitudes

Here are only three of the areas seeming to need education's attention, but note that all three have an integrated relationship. That this relationship is in turn related to this

present investigation of color preferences, seems evident; when it is reasoned that the understanding of color preferences of children is basic to the practical application of these studies. It is to be preferred that judgments as to the validity of this statement be reserved until all chapters of this thesis have been studied. Chapter V contains evidence to support this contention.

CHAPTER IV

Presentation of Data

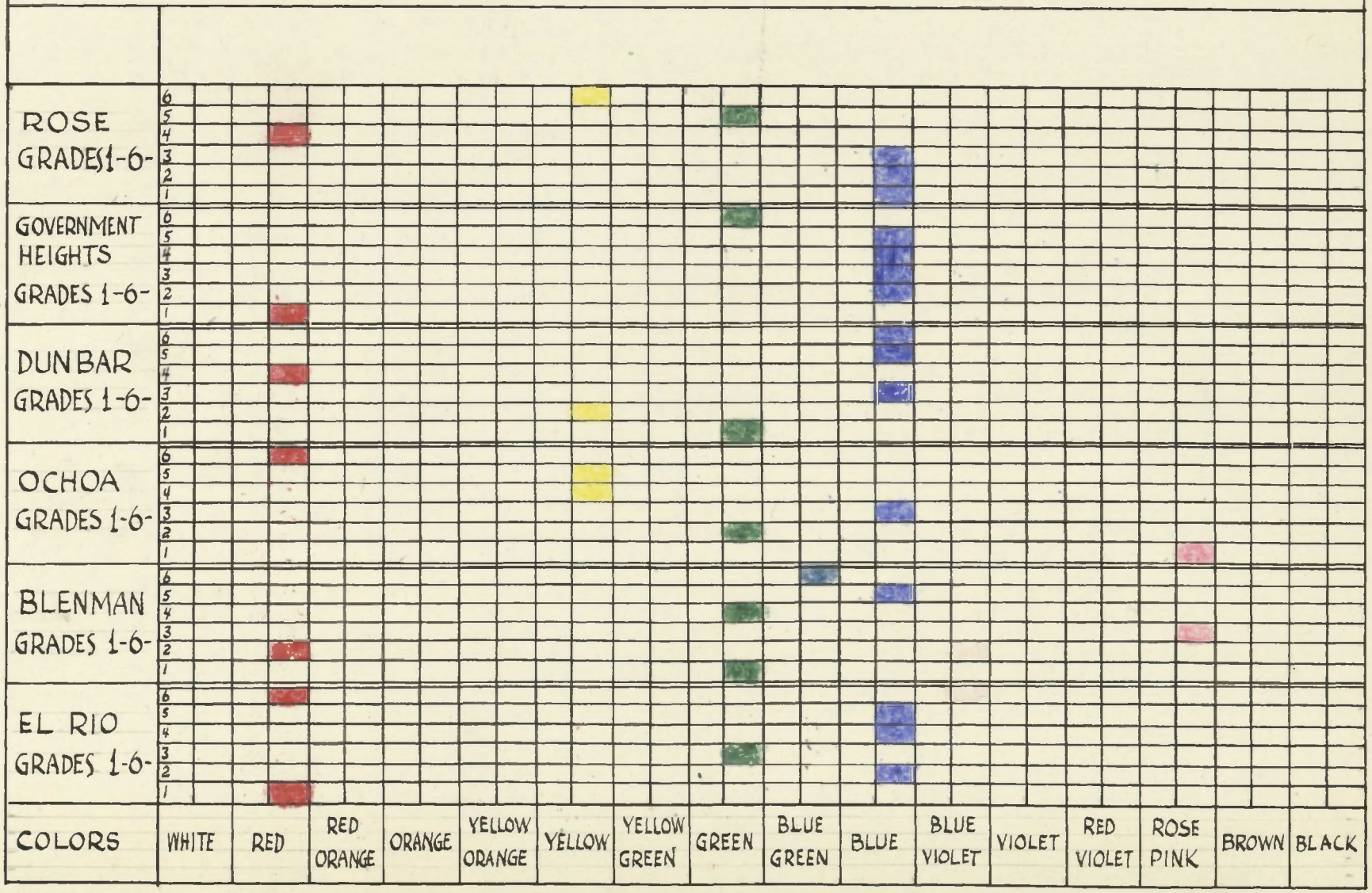
At first glance, the casual observer of the color preference graphs, has thought that the graphs are remarkably similar, because of the apparent modal distribution of the graphs. The real modal distribution has taken its proper place and meaning when the observer has noted that there are two columnar sections for each color: one expressing the color preferences of boys, the other, girl's color preferences. The sum of both sectional columns, in the same color, has now affected the modal distribution of the predominant color preferences; a different significance than that which was first obtained by the casual glance, has now been obtained.

It was the purpose of this chapter to present graphically the significant finding of this study. Crayons were used to color the graphs so that the color used corresponded exactly to the color preferences as expressed by the subjects.

This investigation into the color preferences of school children was begun in March, 1951, at the Rose Elementary School, Tucson, Arizona. Color preferences were collected from children in grades one through six. From the range of sixteen available possibilities, preferences were expressed, at the Rose School, in fourteen colors; white and blue violet drew no expression of preference whatsoever. The

FIGURE I

Figure 1 ROSE~GOVERNMENT HEIGHTS~DUNBAR~OCHOA~BLENMAN~EL RIO
SCHOOLTEACHER COLOR PREFERENCES



six teachers of the six grades sampled, indicated by their expression of color preferences, that blue (choice of three teachers) was a favorite: red, yellow and green tied with one preference each. Figure 1, page 51, has explained this in graphic form. By examining Figure 2, page 53, the reader may determine the order of preference in the fourteen expressions of color. The first, second and third choices of color preferences, in that order, were red, blue, green. The enrollment at the Rose School was drawn from a mixed, socio-economic segment of Tucson's population: Anglo-American, Spanish-American, and a few American Indians and Chinese-Americans.

The children of the Government Heights Elementary School, grades one through six, chose for their selections, fourteen out of sixteen color possibilities. White and blue violet again were conspicuously absent. The order of preference was, respectively, red, blue and blue green, for the first three choices; see Figure 3, page 54.

The teacher color preferances of the six grades sampled at Government Heights showed blue to be favored by four, and red and green garnered one choice each. The absence of yellow from both children's and teacher's predominant preferences, may or may not be indicative of an integrated concern about color preferences by both child and teachers. It can be ascertained from an examination of Figure 3, page 54, that yellow occupied ninth place in the order of children's

FIGURE II

Figure 2

ROSE ELEMENTARY SCHOOL
COLOR PREFERENCES

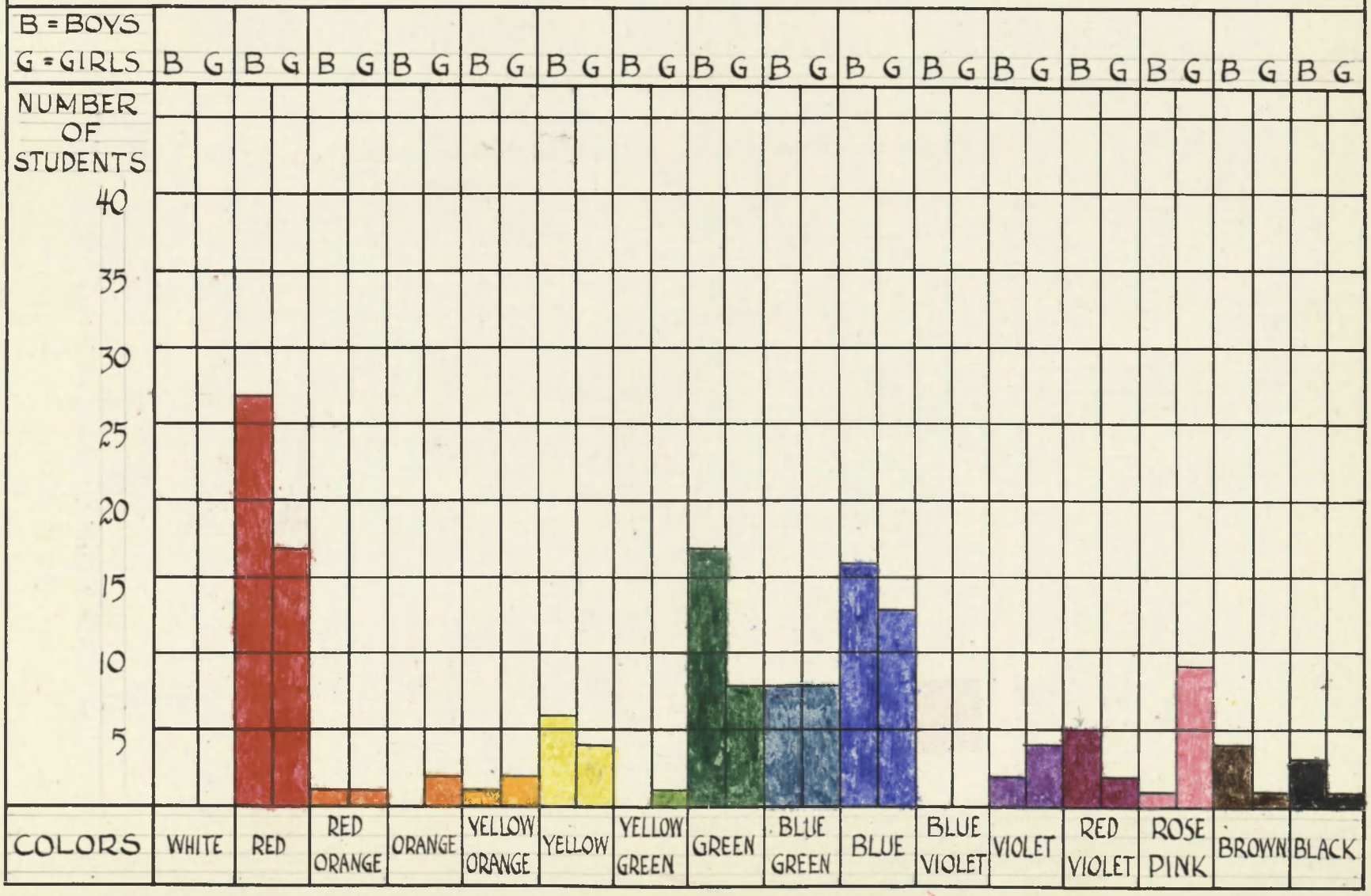
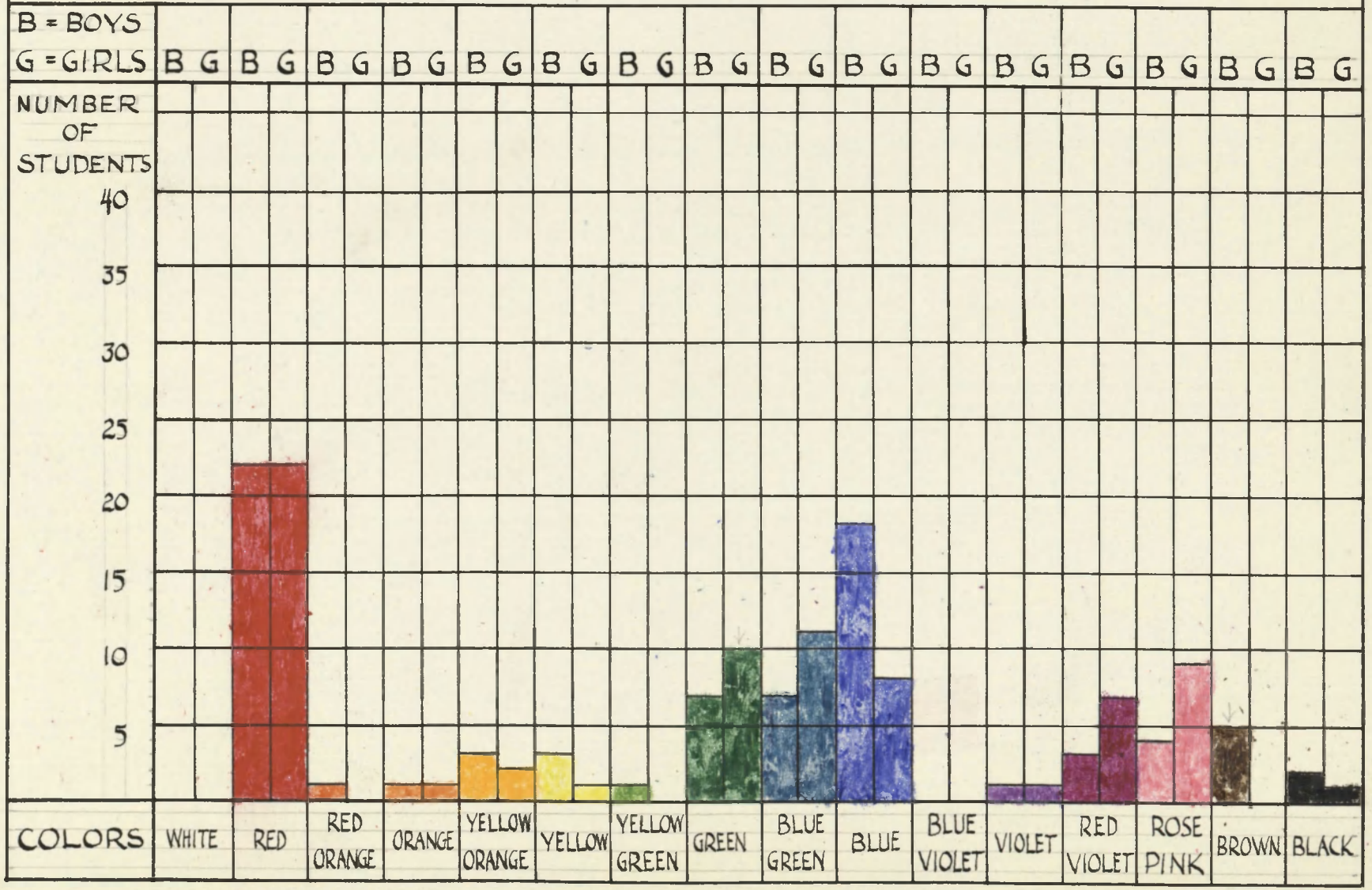


FIGURE III

Figure 3 GOVERNMENT HEIGHTS ELEMENTARY SCHOOL COLOR PREFERENCES



preference at the Government Heights School. From an inspection of the preferences from the five other schools, it was found that yellow at the Government Heights School was lowest in rank order of children's preference at all the school inspected.

From the fourth graph, Figure 4, page 56, it was stated (from the limited sampling) that the first three color preferences of the negro children at Dunbar School were red, rose-pink, red-violet, and blue. In order to not distort or slant the interpretation, it can be seen that blue is almost at the level of preference as red-violet and rose-pink; yellow is also very close to this level.

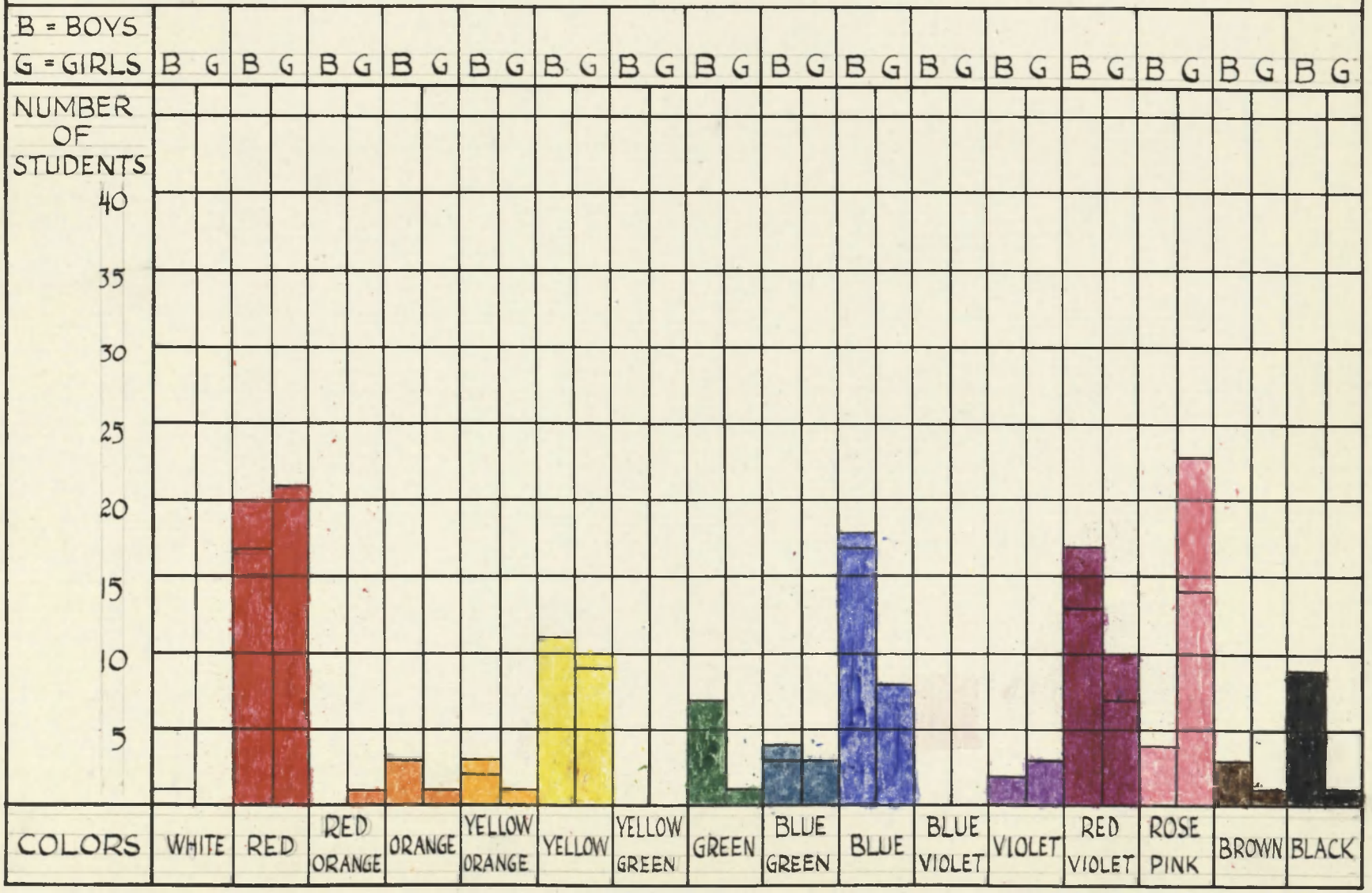
One preference for white, in fact the one preference for white expressed within the total of 1007 expressions of school children's color preferences, has been stated by a nine-year old, third grade schoolboy at the Dunbar School. Yellow-green and blue-violet were unexpressed as preferences from amonst the available sixteen colors.

The teachers of the six grades at Dunbar expressed the same color preferences as did the teachers at the Rose School: three indicated preferences for blue, one each for red, yellow and green.

At the Ochoa Elementary School, color preferences of grades one through six, Figure 5, page 58, showed a different range of expression. From the list of sixteen possibles, the

FIGURE IV

Figure 4 DUNBAR JUNIOR HIGH SCHOOL AND ELEMENTARY SCHOOL
COLOR PREFERENCES



white absented itself from the color preferences; brown also was absent; but red-violet was first in the preferred listing, with blue-green second and red in third place. These choices may have been determined by hereditary environmental factors. Many American Indians are enrolled at Ochoa School; both colors (red-violet and blue-green) have been deeply significant in indian color psychology in Arizona. Boys have preferred blue-green[1], (nineteen expressions), to any other color; girls stated the next highest number of preferences, (seventeen), red-violet. The third highest number was stated by sixteen boys who also liked red-violet.

The Cochineal, a spider-like insect whose juice was greatly prized as a crimson dye and the color extracted from a seashell were both partially responsible for the culturally inherited liking by the Indians of the southwest for the color red-violet.[2]

The teachers of the six grades sampled at Ochoa also differed in their color expressions. Whereas the teachers of the Rose, Government Heights and Dunbar schools went more for blue, the teachers at Ochoa divided their choices, yellow first with two and red, green, blue, and rose-pink each with one preference.

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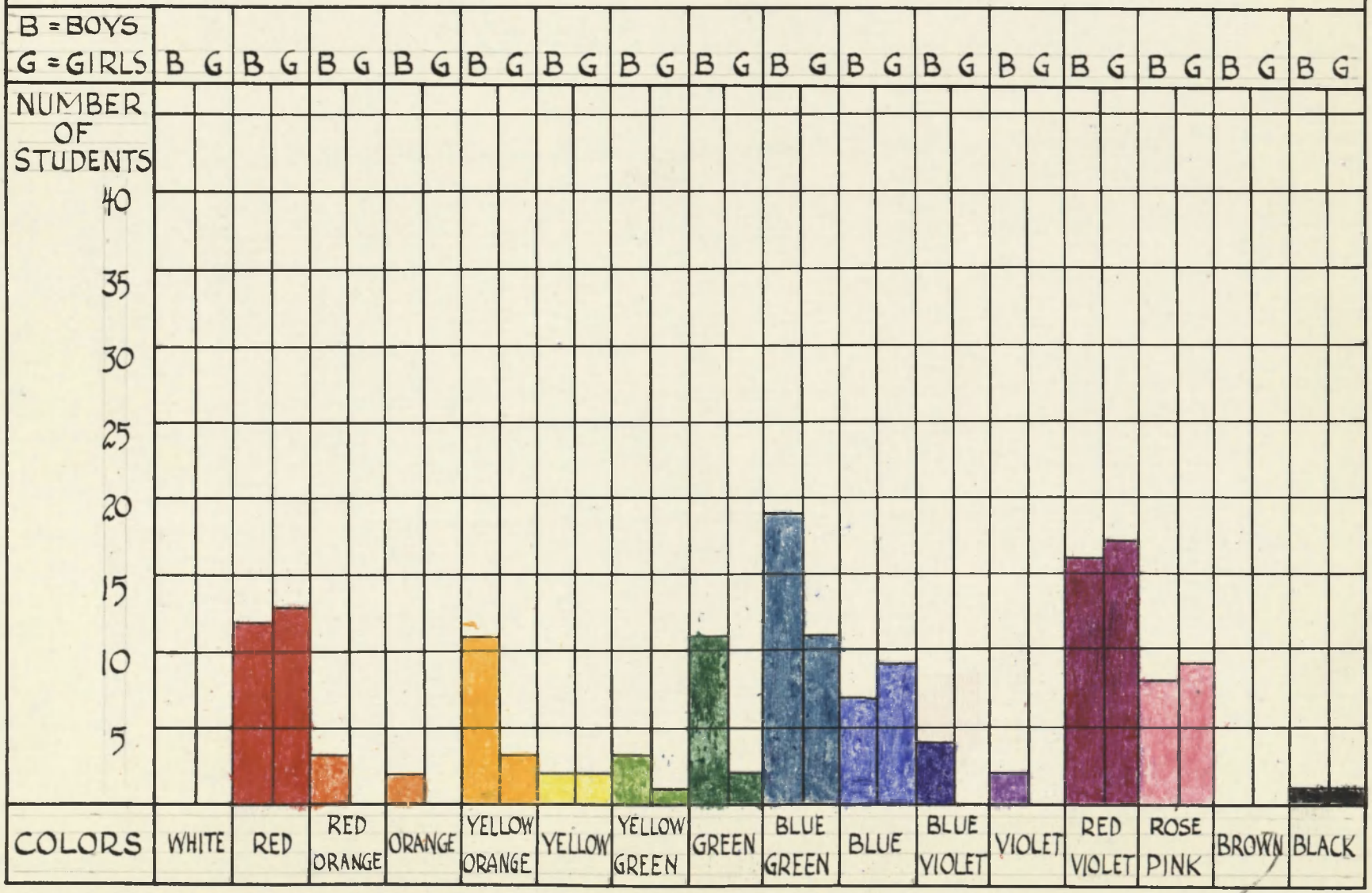
[1]Gertrude Hill, The Use of Turquoise Among the Navajo, p. 4, Kiva: published by the Arizona Archaeological and Historical Society.

[2]Ettore de Grazia, Arizona Artist, Studio: North Campbell Ave. and Prince Rd., Tucson, Arizona.

FIGURE V

Figure 5

OCHOA ELEMENTARY SCHOOL
COLOR PREFERENCES



It could be that because the pupils of the Blenman Elementary School have been drawn from a different section of the city of Tucson, where lived a higher economic group, that such a diverse selection of color preferences occurred amongst the samplings taken from that school. See Figure 6, page 60. The combined likes gave blue, red and red-violet in the order named; but separately, the boys expressed a preference for first blue; then tied three colors into second place preference, red, green and red-violet. However, the girls had different ideas on what they liked: red-violet came first with sixteen, with a four place tie for second place, red, blue-green, blue, and rose-pink, with eleven girls on each. For third place they settled on yellow, with eight votes. White and blue-violet have again been overlooked when it came to the expression of color preferences.

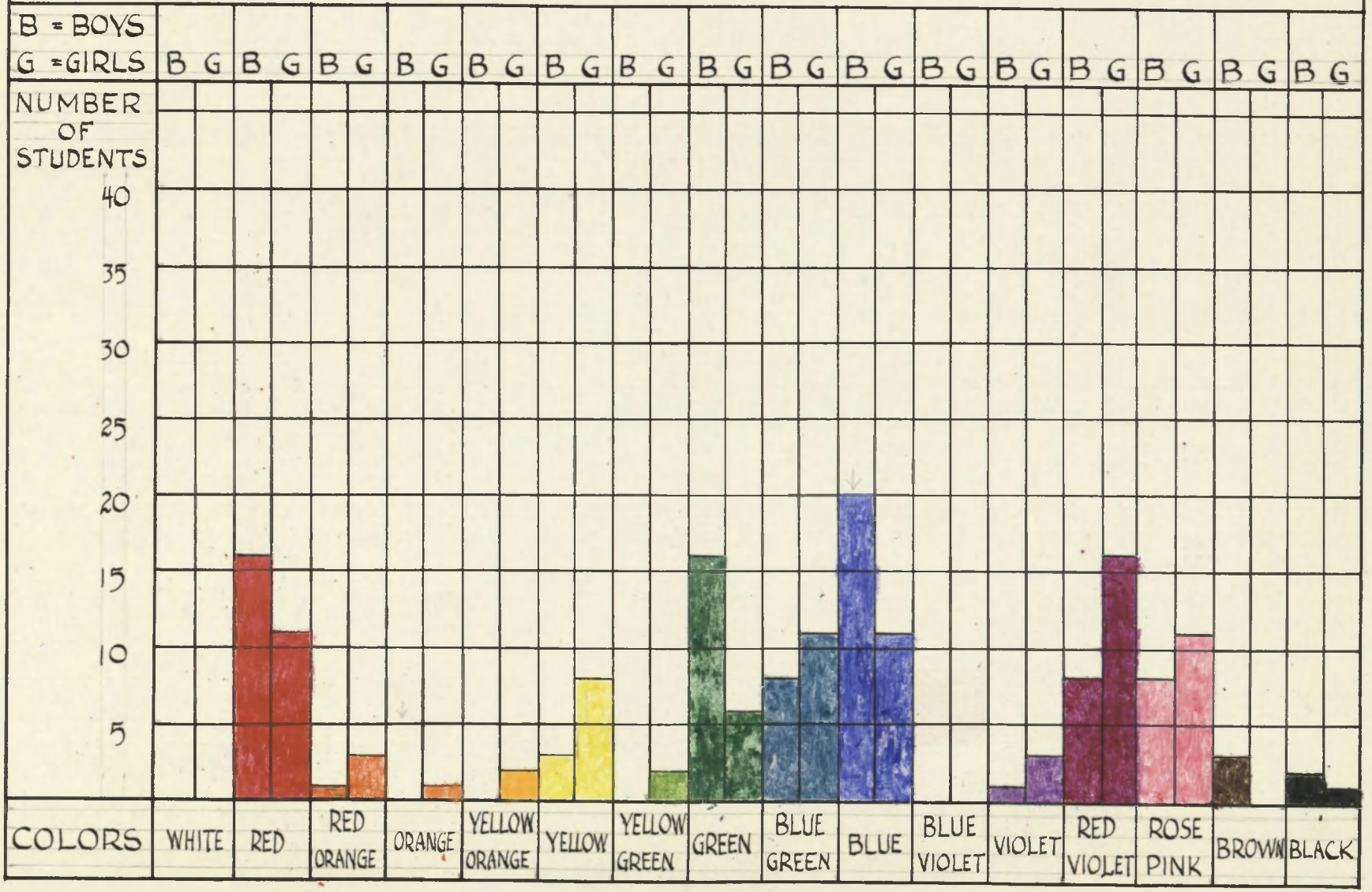
The teachers of the Blenman School expressed somewhat different preferences from the previous schools: two teachers liked green, one teacher each liked red, blue-green, blue, and rose-pink.

The boys and girls from the six grades, one through six, sampled at the El Rio Elementary School, displayed a more concerted unity in their joint choice of color preferences. According to Figure 7, page 62, both boys and girls were unanimous in the choice of red as their highest ranged preferred color. Unanimity again prevailed with the selection of red-violet as second choice, but here their paths

FIGURE VI

Figure 6

BLENMAN ELEMENTARY SCHOOL
COLOR PREFERENCES



separated. Blue-green was the third highest order of preference of the girls with eleven votes which, reinforced with six boys who also liked blue-green, carried the joint expression of blue-green as combined boy and girl third best color. However, boys as separate from the girls, preferred blue with nine expressed statements for blue.

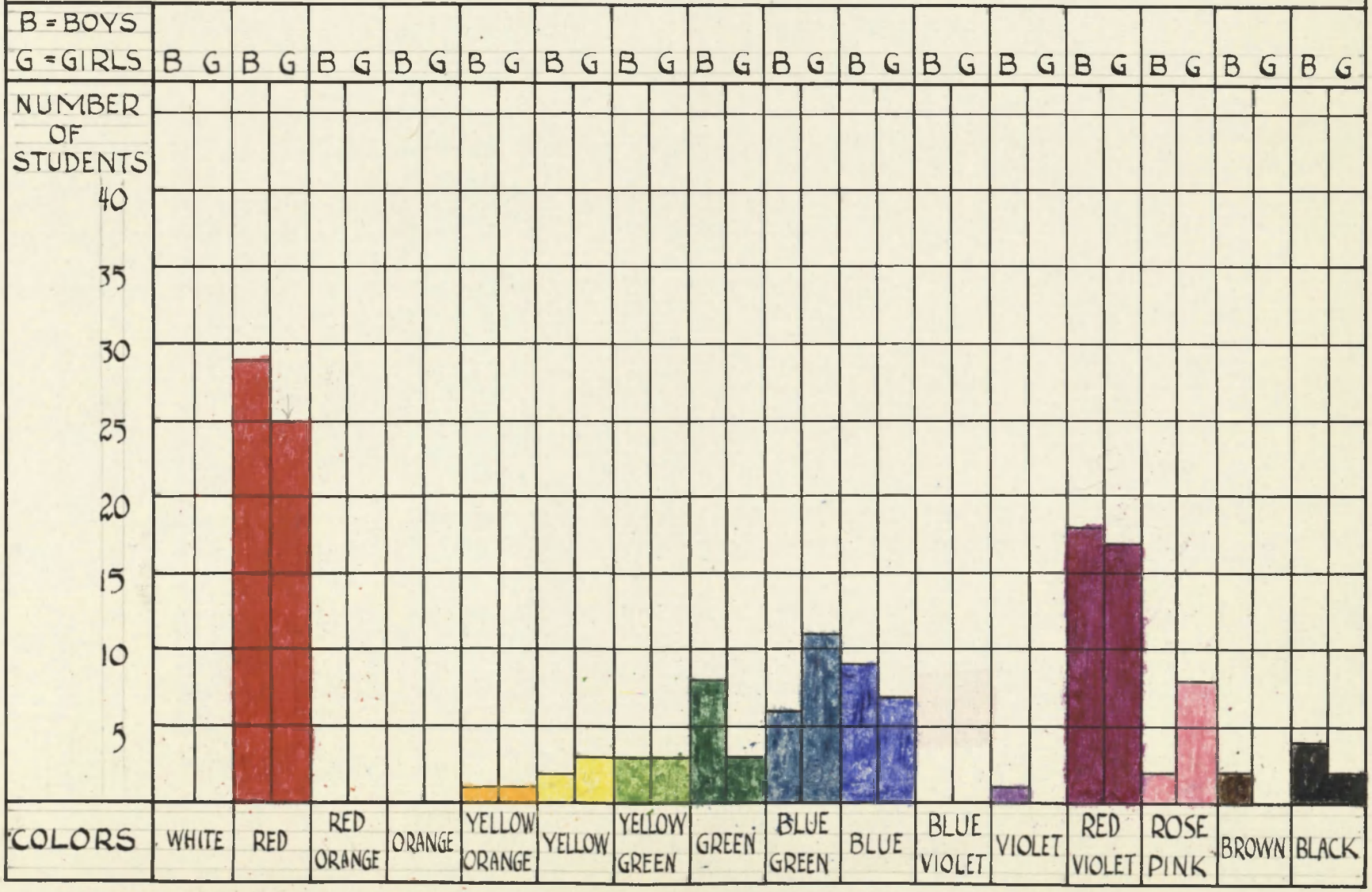
No boys or girls made any expressed preferences for white, red-orange, orange or blue-violet. This resulted in the narrowest range of preference among the six schools sampled: twelve out of sixteen available colors. With such limited data, it cannot be determined whether or not the fact that most of the pupils at the El Rio School came from Spanish-speaking homes, had anything to do with the unanimous color preferences or the narrow range of selection, but it may suggest a need for further investigation. The teachers at El Rio expressed the same preferences for color as did the teachers at the Rose School: three blue, one each for red, yellow and green.

The almost total lack of white in the expressions of color preferences was due to the psychological fact that by the use of "white" cards as a carrying medium for the statements of color preferences, "white" was constantly present in the testing situation. White upon white allowed for no contrast; however, the reality of our society is better expressed by the use of "white" paper rather than grey or black.

FIGURE VII

Figure 7

EL RIO ELEMENTARY SCHOOL
COLOR PREFERENCES



In the next chapter the reader may obtain insight as to why blue-violet drew only four statements of preference from 1007 children, when the several theories of color are discussed.

From the total expressions of preference sampled from six schools, grades one through six, it was apparent from 235 statements that red was the most popular color; blue was second with 144 preferences, and contrary to popular opinion,[1] 136 pupils out of the 1007 decided that red-violet was the third favorite color. Blue-green was favored by 107 children. Green and rose-pink were evenly split with 96 children preferring each. Yellow was liked by only 55 boys and girls, and only 30 favored yellow-orange. The rest of the sixteen colors, in descending order of preference were: black by 28 children; violet, 20; brown, 19; yellow-green, 14; orange, 11; red-orange, 11; blue-violet, 4; and white, only 1.

The present chapter presented the color preferences as expressed by teachers of six elementary schools and 1007 children, grades one through six.

It was the purpose of the following chapter to analyze the results and point to some significant implications of the data collected.

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[1]Letter from Binney and Smith, Crayola Company, N.Y.: See appendix.

CHAPTER V

Analysis and Interpretation

> In the school of the future-----there will be an increasing need for developmental facts, obtained by reliable methods of observation; there will be more need than ever for methods of measuring what is being accomplished. Enlightened parents will seek more information about what the schools are doing, and what changes are being brought about in their children. Taxpayers may demand from the schools an accounting of results, in terms of objective standards which will be intelligible to the layman.[1]

From six Tucson Public schools, 1007 cases of colors preferred by school children were collected from thirty-six classes, grades one through six. An analysis of results showed that, though red, blue and red-violet topped all other colors in the rank order of total preferences, it would have achieved nothing to have examined this information against a vacuum. A background possessing measurable points of reference was needed before a meaningful analysis of results could be obtained and without this meaningful analysis, no revelant interpretation could be attempted.

It is recognized that color is a power and influence

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[1]J. Harold Williams, Education, pp. 417, f. Vol. 53, Mar. 1933. "Some Results of the Testing Movement."

in the life of everyone.[1] It is in the hands of whomsoever teaches anything to a child to realize the value of this power and use this power according to the value that can be derived therefrom. The use of color expression by children of varying degrees of mental individual differences, as well as physical individual differences has been explored by a number of informed people. In the Annual Review of Psychology, volume 1, 1950, under "Vision" which was reviewed by Neil R. Bartlett, a cogent generalization was recorded. "Visual acuity is shown to increase with illumination;" authorities: Evans, Wright, Helmholtz, and Lewerenz.

This factor could account for many of the color preferences obtained in the prosecution of this thesis. It was the observation of this investigator that in some of the classrooms visited the illumination facilities were not entirely desirable. In the unconscious striving for visual acuity in the presence of poor illumination the children may have been influenced to select the colors that they stated as their preferences.

Selig Hecht, as reviewed by Psychological Abstracts, volume twenty-four, number one, January, 1950, was quoted from his original article; Brightness, Visual Acuity, and

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[1] Sexson, op. cit.,

Ami Mali Hicks and Catharine Oglesby, Color in Action, foreword, New York: Funk and Wagnalls Co., 1937.

Colour Blindness.

> Measurements were made of the dark adapted foveal threshold of normal and colour blind persons in five parts of the spectrum using a one degree circular test field. Compared to normals, protanopes show an elevation of the threshold which increases slowly from blue to yellow and rises rapidly thereafter until in the red the threshold is more than ten times as high as normal. Deuteranopes' maximum in the green is only about seventy percent above normal. Measurements were made of the illumination necessary for equal visual performance in normal and colourblind subjects. Protanopes require one hundred and nineteen percent and deuteranopes fifty-five percent more light to achieve visual acuity of 0.29 reciprocal minutes. These values agree closely with those found in the luminosity measurements.

These authoritative statements should lead to a suspicion of possibilities concerning the relation of individual differences to illumination facilities in the Tucson Public schools. More credence was applied to this thought by Garth, Psychological Bulletin, Volume 41, number six, for 1944, when he submitted his findings: that out of 399 American Indians tested, 1.79 percent of them were found to be color blind. Clements tested 323 negroes and found a color blindness of 3.70 percent. Clements had also checked 624 Indians and 1.90 percent were color blind. Three investigators, Van Planta, Miles and Haupt, tested 3700 whites and agreed closely on the percent of color blindness found, which was, roughly 8 percent. "Men and animals, like plants, may be variously influenced by color in their life processes, their health, sickness, and well-being, whether or not the color is actually seen by

them."[1] Though the scope of this thesis did not include the study of color blindness, it seems that its recognition cannot be excluded. This area clearly needs further study and practical application to the fulfillment of individual needs of children.

An interesting theory has been offered by E. R. Jaensch in Eidetic Imagery in noting the differences in the "sunlight" of the tropics and its effect on the pigmentation of humans; not only on human skin but people of geographically tropic origin usually have dark hair and dark eyes. According to Jaensch these "brunettes" usually have dark eyes which are adapted for "sunlight" by means of tiny red droplets in the dark pigmentation of the eyes. This is called red-sightedness, and acts much as a camera filter in filtering out the redness of tropic sunlight. This results in the lack of red on the rods and cones of the eye, which lack is compensated for by a desire for red and all warm hues in many of the controllable color factors of their lives.

On the other hand, blonds come from polar regions where "skylight" predominates. The protection of the eyes against the blue glare of "skylight" is blue or green pigmentation. This assumes that blue or green-eyed people (all light-eyed people) with lightly pigmented hair prefer blue and green; and have a decided preference for the cooler colors and the

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[1] Birren, Color Psychology and Color Therapy, op.cit., p. 106.

softer tones.

In an effort to check on this theory, this investigator noted the relation of color preferences to color of eyes of the teachers in three of the schools that were visited.

After examining the evidence presented by Chart 7, page 69, this theory, advanced by Jaensch, on the determination of color preference by geographical origin, does not seem to be valid; as many teachers with brown eyes preferred blue as did others with blue eyes. Extending this theory of geographical determinance to the color preferences of school children, the enrollment at Blenman yielded more blue-eyed children in proportion to brown-eyed than each of the other five schools. Here again, Jaensch's theory fell through. The total count of children in the grades tested, one to six, was 176 children; 115 blue-eyed (or related) and 61 brown-eyed (or related) children: only 44 percent of the blue-eyed preferred the colder colors (blue, green, etc.) compared to the 56 percent who stated preferences for the warmer colors (red, orange, yellow, red, violet, etc.). This contradictory result was reflected by a similar contradiction of the brown-eyed children: 46 percent preferences for the warmer colors, and 54 percent liking the colder colors. This surprising result suggested an opposite theory to Jaensch's, but the difference was not significant and probably the result of chance. Nevertheless it must be concluded that Jaensch's theory cannot be applied.

CHART VII

Relationship of Teacher Color Preferences to Eyes at the Blenman, El Rio and Dunbar Schools

Schools	Teacher Color Preferences	Eyes
Blenman	green	blue
	red	brown
	pink	green
	green	blue
	blue	gray
	blue-green	brown
El Rio	red	brown
	blue	green
	green	brown
	blue	blue
	blue	blue
	red	green
Dunbar	blue	brown
	blue	brown
	red	brown
	green	brown
	blue	brown
	gold	brown

As a further check to Jaensch's theory, El Rio School was subjected to a similar analysis. It was found that from the total number of 166 children, grades one through six, tested, 33 were blue-eyed (or related) and the remaining 133 were brown-eyed (or related). Only 21 percent of the blue-eyed preferred the colder colors compared to the 79 percent liking the warm colors. Of the 133 brown-eyed a result favoring Jaensch's statement showed 61 percent expressing a preference for the warm, red-orange, yellow, red-violet colors contrasted to 39 percent stating their preference for the cold, blue-green, blue-violet, brown, black, colors. In this case no clear-cut decision could be made; in the absence of objective proof Jaensch's theory must be suspended pending further inquiry.

The collection of the color data on eyes was mentioned at the end of the exact method of procedure, under number one, Usefulness and Comprehensiveness of Content, Chapter III. The reason for not fully discussing the color of eye data was so stated at that time.

Faber Birren refers to several authorities in his book, Color Psychology and Color Therapy. M. Imada in a study of the color behavior of children stated that their color preferences were not haphazard. "Children given black crayons, would draw inanimate things, vehicles and buildings. The same children, given colored crayons, draw human beings, animals and plants: red, with yellow, and red with blue were favored combinations."

The above statement does not square with the data obtained for this thesis. The form of preference was set forth in inanimate manner: a square or a circle, and still few of these were stated in black. Only 28 preferences for black were recorded by 1007 children while engaged in inanimate expressions of color. These same children were given a set of sixteen colors ranging from white, through all colors, to black.

"Ann Van Nice Gale found yellow popular in combination with red-violet or blue. The combination of blue and green was also liked." This finding of Miss Gale was substantiated by this investigator if it is allowed that the human eye prefers to mix pure colors to arrive at dynamic combinations of visual sensation. This theory was first advanced by the "impressionist" painters of Germany, France, and England, who came to realize that juxtaposition of pure color was preferable to the monochromatic use of color which violated the primary relationship of the effect of color as a sensation on the working parts of the eye. This theory was based on the scientific findings of Helmholtz. Thus yellow is essential to the sensation of green by juxtaposition to pure blue; red to violet to produce red-violet; blue to green which give blue-green.

The preferences of teachers, Figure 1, page 51, have stated that teachers, regardless of color of skin and eyes, as a group have preferences similar to the impressionists.

This "impressionist" theory could account for the findings of this present investigation. Upon examination of the data of Rose School, Figure, page 53, it will be recalled that from sixteen colors, red, blue, green, blue-green, yellow, rose-pink, and red-violet were outstanding. It may be inferred that childrens' eyes prefer the dynamic sensation of the juxtaposition of pure color to the static monochromatics. What occurred, in this respect, within the data obtained at the other five schools?

Government Heights, Figure 3, page 54, provided the reader with the information that red, blue, blue-green, green, rose-pink, and red-violet, corresponded well with the previous findings. The Dunbar School, Figure 4, page 56, had similar color preferences to the preceding data, with red, red-violet tied with rose-pink, blue, yellow, black, green, and blue-green as the expressed preferences. The children at Ochoa, Figure 5, page 58, liked to visually mix their colors by the dynamic "impressionist" principle of juxtaposition as did the other schools, but in a somewhat different order of preference: red-violet, blue-green, red, rose-pink, blue, and green.

Though yellow was somewhat lower on the rank order of preference, it must be taken into account that the psychological and physical presence of sunshine, especially in Arizona, may be responsible for the seeming indifference to yellow pigment. After image effects (of sunshine) tend to produce the impression of a complementary color. Complementary color is

defined as an opposite; as red is to green, yellow is to blue. Figure 6, page 60, Blenman, preferred blue, red, red-violet, green, blue-green, rose-pink, and yellow, and thereby remained consistent to the juxtaposition theory of pure color. El Rio, Figure 7, page 62, completed the tabulation of pure color mixed by juxtaposition with red, red-violet, blue-green, blue, green, and rose-pink, in the order named.

To summarize, the study by Ann Van Nice Gale has been reliably confirmed by this writer's data on the color preferences of Tucson School children.

Color synesthesia is another psychological phenomenon that could account for the color preferences of children. Francis Galton was the first serious investigator of this peculiar association of color imagery.[1] He reported cases of people who associated particular colors to vowels, to letters of the alphabet, to consonants, to days in the week, to numbers, and to special words. Synesthesia is commonly known in music; "blues", "hot", "red hot", "mood indigo", are some of the commonly recognized terms. This phenomenon of synesthesia in children sharply indicates its psychological import. It extends to many aspects of a child's life. Some of these factors are found in food, toys, clothes, children's books, playmates; and many of them continue to color lifelong attitudes. These associations are possibly reflected in the expression of color preferences.

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[1]Birren, The Story of Color, op. cit., p. 288.

With these aforegoing interpretations of the color preferences of school children, it cannot be assumed that definitive categories can be validly assigned to the stated areas of color preferences. It remains for future investigations in the areas of color acuity, color blindness, physical and mental environment, to point the way toward a more individually efficient, more socially effective, and happier future for each secure individual in an integrated democracy.

CHAPTER VI

Summary

It was the purpose of this study to investigate the color preferences of school children, grades one through six, in the Tucson Public Schools.

The method of securing the color preferences was patterned on the structure provided by Deming's six important characteristics of a good sampling survey. The materials conformed to these criteria but were selected from materials applicable to present school conditions. Benney and Smith "Crayola" crayons, number 16, and 4" x 6" white filing cards were used to record the expressions of color preferences of the 1007 children tested.

The previous literature on color revealed more complete analyses and understandings by fields other than education; however, it was shown that there is now an awareness of the educational implications of color and efforts are being directed toward the application of better color psychology by educators and schools. The physical and psychological factors were both subjected to detailed inspection by many types of specialists.

Conclusions: The following conclusions were derived from the findings of this thesis.

1. The data collected from the six schools showed that the color preferences had differences in their rank order in each of the schools sampled.
2. It is more valid to compare individual preferences within a group, rather than without, because of the possible homogeneous nature of individual differences within a sub-culture grouping.
3. As a whole, the color preferences of the children in the six schools sampled, Rose, Government Heights, Dunbar, Ochoa, Blenman, and El Rio, grades one through six, showed a pattern of similarity.
4. The rank order of the color preferences of 1007 school children, so far, has shown that red, blue, and red-violet are the top three most favored colors, in six schools in Tucson.

Recommendations: In view of the findings the following recommendations seem warranted.

1. Since it seems that color preferences are not standardized but vary from group to group within our social structure, it is recommended that teachers and administrators seize every opportunity to use a greater variety of materials, methods and techniques for presenting color situations to children.

2. It is recommended that positive color preferences be recorded in the accumulative record along with other data relative to the measurement of a child.
3. It would be preferable to have all teachers involved in the teaching of color to children from Spanish-speaking, etc., homes to be conversant with color names and terms in that particular language.

Limitations of the Study: The exingencies of time unfortunately limited the sufficient development of this thesis.

The validity of the study would have been improved if the subjects used had been selected at random. The lack of knowledge concerning the true origin of color preferences is a definite limitation. The possible inconstancy of the color preferences of school children is another limitation. No attempt was made to test the reliability of the data.

Suggestions for Further Research: It is suggested that this thesis be further developed along the same lines; that a wider sampling of the color preferences of school children be accumulated.

It is recommended that an investigation be pursued into the origin of color preferences; that the source of initiation of the preference be exposed. Much would be added to the understanding of learning and teaching if this could be done on an individual basis.

It is advisable that the constancy or changeability of color preferences be validly determined, and at what ages this might occur.

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Gold Medal Products

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APPENDIX

IN REPLYING PLEASE REFER TO H.J.MacNeill

April 16, 1951.

Mr. Leo T. Ryan, Jr.
P.O.Box 4634, University Sta.,
Tucson, Arizona.

Dear Mr. Ryan:

Your letter of April 2nd has been held for reply until the writer returned from a trip out of the city.

Answering your questions, may we say that any decisions with regard to color assortments, color preferences, etc., have always been arrived at after consultation with educators in the public school and college field. We take nothing for granted.

With regard to details as to how our company arrived at the specifications for #16 "Crayola", may we say that matters of this sort are decided on by our technical staff, which is made up of chemists.

With regard to any information we may have as to which colors are called for on refill orders, may we say that, generally speaking, the primary colors - Red, Yellow and Blue - are called for on refill orders more often than others, while such colors as the secondary and tertiary colors are purchased in bulk regularly by schools and individuals.

Very truly yours,

BINNEY & SMITH CO.

H.J. MacNeill

HJM:SH