

VISUAL PERCEPTION

A Review of the Literature relating to Studies
relevant to the Development of
Teaching Materials in the Commonwealth

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In this paper, commissioned by the Commonwealth Secretariat, the views expressed are those of the author and should be regarded as such.

FOREWORD

This review of researches and studies of visual perception in relation to teaching and learning in Commonwealth countries was originally undertaken by Mr. Edward Clunies-Ross, who unfortunately had to relinquish the task at an early stage on account of ill-health. Mrs. Helen Coppen took over the work and has provided this collated study which shows not only what has been done, but how much there is still to do before we can, with confidence, exploit visual means of teaching in situations where the culture of the people is considerably different from that of the Western technological societies. At the same time it does provide guidance on the design of visual materials and identifies clearly certain considerations which should be observed by those who use diagrams, pictures, charts, photographs and films to teach both young and old in non-Western cultures.

Teachers and extension workers everywhere will be grateful to the Commonwealth Secretariat for commissioning this survey. Despite the plethora of journals and conferences, the field worker still finds it difficult to learn about the experiences of others involved in the same problems of communication that beset countries seeking to expand and improve their education services in an effort to improve their socio-economic conditions.

L.J. Lewis
London June 1970

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VISUAL PERCEPTION

INTRODUCTION

1. This study has been prepared with a view to the needs of those who design materials for teaching. Working in schools that operate in a social milieu which is dependent on the spoken rather than the written word, and attempting to communicate with non literate adults both school teachers and adult educators urgently need illustrations and visual materials of all kinds. Over the last two decades as teachers and field workers have become aware of the fact that the pictures and diagrams they were using failed as communication channels, so have the research workers followed in their wake, trying to determine the factors that affect the way visual statements are interpreted.

2. In a paper appearing in Teacher Education in New Countries 1969, Vol.10, No.2, Howard Poole observes that research over the last decade has indicated that Africans south of the Sahara suffer from certain perceptual deficiencies in terms of successful adaptation to modern society which result from their not organizing the perceptual world as people in Western society do. Pupils in schools in many parts of Africa experience difficulty in perceiving patterns, in visualizing and orientating figures and in three dimensional perception. They also respond differently to certain optical illusions. There is evidence that some of these difficulties are experienced by other non-Western cultural groups though most of the experimental work published in English has been carried out in African countries. On this I have drawn heavily and occasionally I have drawn on data from non-Commonwealth countries when the material has illuminated or reinforced a particular generalisation I wished to make.

3. The papers reporting the findings of experimental work that have been consulted in preparing this collated study are listed with brief annotations at the end of this essay. The studies fall into two main groups:

(1) studies of perceptual abilities related to the attempts to convey meaning compared with a European "norm", (2) studies of perceptual problems of special interest to research psychologists in an attempt to determine if certain attributes such as the perception of optical illusions are race linked, or culture bound. Meaning in the latter case is of no consequence except in so far as that, by extrapolation, the application may be found. The studies of perceptual abilities have been grouped in such a way that conclusions may be drawn which, I hope, will throw light on problems of the designers and users of visual means of communication such as book illustrations, wallcharts and diagrams, posters. This grouping constitutes the framework of this essay.

4. The first problem in any visual presentation (other than a work of art, in which the artist wishes to convey feeling and tone as well as descriptive statement) is that of recognition by the viewer of the objects depicted which may be presented with varying degrees of realism.

5. The second problem is connected with the viewer's ability to assign meaning to a picture when two or more objects are placed in relation to each other. Interpretation of the meaning of a scene, leads on to the problem of connecting one scene with another, as in a filmstrip or a film or a television story. The ability to follow a sequence of statements of this kind is a

function of mental maturity and some research workers such as Zazzo* suggest that only at the age of about 12 years can a child connect a sequence of events in a film.

6. The third class of problems is concerned with the ability to understand or read schematic visual presentations such as maps, flow diagrams, hierarchical and organizational charts. The ability to find meaning in topological statements and diagrams of relationships is not unconnected with the existence of a conceptual framework or 'schema' in the mind of the viewer, on to which such diagrams can be fitted.

7. An extension of this class of schematic presentation, in essence a visualized abstraction, is the instructional diagram for performing a manual operation. Some studies have been carried out which suggest that the ability to 'read' such manuals is an acquired skill, based on practice in the interpretation of three dimensional representations.

8. The fourth category is more difficult to define in that it involves the use of visual statements in a symbolic manner, for example a picture of a mother holding a baby intended to symbolize motherhood. Characteristically posters rely on the interpretation of particular objects to stand for the general class.

9. To the fifth and final section I have assigned those studies that have some relevance in that they examined perceptual abilities, but their application to the solution of the illustrator's problems is not immediately apparent.

* Zazzo, R. in Revue Internationale de Filmologie Paris, 1952, Vol.9, pp. 26-36.

SECTION 1

Recognizing Single Objects

10. The first category of problems is that of recognising representations of single objects. This depends on the ability to connect the abstract lines and shapes on a piece of paper with the real concrete world. Seth Spaulding writing in Audio Visual Communication Review, Winter 1955, Vol.3, No.1, in an article entitled Research on Pictorial Illustration maintains that "an illustration is an abstraction, and for the viewer meaning exists only to the extent to which the observer has experience with which to interpret the drawing and to the extent to which the observer can relate the lines on the paper to the actual experience which it represents". A year later, reporting on a study of the illustrations designed to help tell a story, or help the reader interpret the text in supplementary reading materials for newly literate adults in Latin America (published in an article entitled Communication Potential of Pictorial Illustrations Audio Visual Communication Review, Winter 1956, Vol. III, No.1) he says again that the illustration had no educative value if the drawing had not been presented in terms of the past experience of the intended audience. If the viewer's experience is limited, the range of pictorial statements that will have meaning is restricted.

11. Most of the non-literate or newly literate people of the Commonwealth live in rural areas, where opportunities for education are limited and life is poor in variety of experience. Once roads are built, people move about, trading increases, changes take place and urban centres develop.

12. With urbanization comes not only greater range of perceptual experiences, but also more opportunities for schooling and it has been noted by a number of investigators that schooling will enable pupils more readily to recognize pictorial representations of the objects they know. In a survey of recognition of visual symbols carried out in Kenya Report on the Recognition of Drawings started by Alan Holmes and completed by Bernard Shaw in December 1969 (mimeograph, available from the Visual Aids Division of CEDO, Tavistock House South, Tavistock Square, London W.C.1) it was found that there was a general tendency for correct answers to recognition tests to increase in percentage proportionately with increase in years of education. In some cases placing the object in a familiar context aided recognition, in others it did not do so.

13. Given that objects can be recognized if they are within the experience of the learner, the designer will ask if total realism is essential or if an outlined form is sufficient. The question of degrees of realism has been studied by several investigators, among them A. Fuglesang, while working on The National Food and Nutrition Commission in Lusaka, Zambia. His Report Communication with Illiterates (1969) is available in mimeographed form from the Commission, P.O. Box 2669, Lusaka, Zambia. He found that line drawings were less effective than silhouettes, which in turn were less effective than a photograph of which the non-essential background had been blocked out. The line drawing does not give enough detail and a fully detailed photograph gives too much. That the inclusion of non relevant details can be confusing was also found by Hector and Hudson when testing if non-literate adults in Johannesburg had grasped the message as set out in industrial safety posters. An abstract of this study is published under the title The perception of safety posters by Bantu industrial workers by Wendy Winter

in *Psychologia Africana*, Vol.10 1963. Items in the background were misunderstood and non-relevant details drew attention away from the important items. Fonseca and Kears working in rural Brazil found that pictorial symbols, to be most useful for young people of limited schooling, must evidence "intelligent selection of detail". Comprehension is reduced either by excessive unnecessary detail or excessive deletion of detail, (Reported in Comprehension of Pictorial Symbols : an experiment in rural Brazil by Luiz Fonseca and Bryant Kears published by College of Agriculture, University of Wisconsin, 1960)

14. Another question that arises when designing illustrations, particularly of textbooks, is that of scale. People inexperienced in pictorial communication can recognize a drawing that is smaller in size than the object it represents, but not an enlargement. Alan Holmes stated this in a personal communication to the writer and refers to it again in his book Health Education in Developing Countries, Nelson 1964.

15. How much detail and what kind of detail are the two questions that still must exercise the mind of the designer of visual material, be it book illustration, handout, wallchart or poster, filmstrip or cartoon film. From the studies we have examined it may be concluded that an illustration of a single object must have a sufficiency of cues which characterize that object and the cues must be relevant to the intended viewer. For example, children in North East Thailand* rely on distinctions of dress to distinguish people of different occupations and status. Sometimes objects are not recognized until shown in a context; for example Shaw, in Visual Symbols Survey, states that a horse had only been identified by 58%, but a horse with a man riding it brought up identification to 88%. I deduce that the additional cues given by the context were the necessary ones that characterize a horse as distinct from a cow, for that community. When offered a drawing it is not looked at as a complete object but it is surveyed detail by detail in a search for the cues that will make recognition possible. For example, rural people in Kenya studied a drawing of a goat, detail by detail and at the point when the tail was reached described it as a cow. Goats have tails that turn upwards and the drawing was wrong in this one respect.

16. Contextualization is unnecessary except to give the essential cues when these are missing in the drawing. Furthermore contextualization can lead to confusion because it is no longer clear what the message is. For this reason photographs may fail to convey the intended meaning because of the elaboration of detail which is in excess of the sufficient number that will characterize that object for that viewer.

17. To summarize, the recognition of single objects is dependent upon there being enough cues which characterize that object, and which are relevant within the environment of the viewer. These cues may or may not include colour. Spaulding, finding that when full colour realism could not be achieved it merely confused, recommends that the use of colour in booklets for new literates should be confined to decorative motifs whenever realistic colour cannot be afforded.

* Aesthetic perception in North East Thailand.

SECTION 2

Understanding a Descriptive Picture or Scene

18. Being able to assign meaning to a scene which includes several items, each of which is recognized, depends on being able to integrate the separate items. In part, the failure to do so seems to account for the inability to perceive pictures three dimensionally. But other factors play a part in effecting ease of understanding, and one of the most important is sheer economy of detail.

19. In his work with newly literate people in Latin America, Seth Spaulding found that the number of objects (in an illustration) that must be perceived in order to interpret an illustration correctly should be kept to a minimum. Following up this guide line, Holmes working in East Africa found that pictures which had several connected items telling a story could not be understood by non-literate adults. Before they could grasp the relationships between the people and the objects in the picture, he had to explain the picture to them in words. The failure to grasp the point of the picture often occurs when a single visual cue has been missed because of the over-rich surrounding detail. Fuglesang also reports that in Uganda pictures suddenly became meaningful when he directed attention to the particular items in the general scene that gave the cue for that particular viewer.

20. Stepping aside for a moment from the main stream of the discussion, I should like to draw attention to the universality of this problem. Difficulty in reading a picture, that is making connections between the separate items is not confined to non-literate societies or to non-Western cultures. M.D. Vernon in The Psychology of Perception published by Penguin Books in 1962, draws attention on page 102 to the fact that, if a picture has a 'meaning' in the sense that it suggests events not actually depicted, a child may not be able to understand this until about the age of eleven years. Younger children do not always notice the items that to the designer seem important or central; they notice what is already familiar and understood. What items a viewer will select for attention is governed by experience and interest. This is the clue to the difficulty experienced by all viewers, whatever the culture, of understanding a complex visual statement. By selecting for attention non-relevant items, the 'story line' may totally escape the viewer. Professor Vernon warns, on page 103 that "showing pictures of historical scenes or people living in foreign countries to children aged under eleven may not give them any clear idea as to the incidents depicted. The children may be confused by the unfamiliar costumes and settings and have no more than the vaguest notion of what the people are like or what they are doing. Or the children may notice only things which are familiar and comprehensible to them..... It is necessary to explain what is happening in the pictures, still more to get the children to talk about them until they show that they really grasp the significant features." This connects with what Alan Holmes found, about explaining a picture and it seems that this is a common need.

21. The difficulty that many adults are reported to have in understanding photographs or realistic pictures may be connected with the fact that in life many things are not seen "frozen" as in a still photograph. N. Spurr suggests in a report to the Colonial Office in 1952 that with the films he made in Tanganyika the objects and people being depicted in motion were much easier to equate with life and were readily understood. Dr. S. Biesheuvel

found, when administering non-verbal aptitude tests to multilingual groups of men seeking employment in the mines in Johannesburg, the same phenomenon occurred. (Reported in "Psychological Tests and their Applications to non-European Peoples," published in The Year Book of Education, Evans Bros. 1949 pp. 10 - 104.) When the tasks were shown in motion by means of a silent film, the men understood what was required of them and were able to perform the manual tasks set out on the test table. But they could not do so when they were shown still photographs. A later experiment by Hudson, interestingly enough, indicated that a colour film was in no way superior to a black and white presentation. Form alone, without colour, provides a sufficiency of cues for recognition to occur.

22. When this experience is considered in relation to some findings from Brazil and repeated in East Africa, an explanation suggests itself. Fonseca and Kearnl* found that recognizable, familiar objects presented in an illustration add to comprehensibility, but that the illustration of a process involving separate steps or actions was not understood, unless at least each main step or action was depicted separately. This general conclusion is confirmed by the finding of Hudson and Hector who noted in their study of the interpretation of posters, as reported by Wendy Winter, that if a simple poster used only two stages to tell a story of the consequences of carelessness in handling tools it was not understood because the two stages did not appear to be connected. Alan Holmes in his study of the understanding of visual symbols in Kenya, published by O.V.A.C. in 1963, found support for the hypothesis that the compression of a process involving a series of actions into one or two pictures is less likely to be understood by people of limited education than when a series of sequential pictures is used, in a close-step sequence. A parallel finding is reported by Helen Colborne when she investigated young English children's understanding of road safety posters and again by Basil Chaplin working on a science education research project at the University of Ghana in 1959-1960. He reported, in a privately circulated paper, that "Instructions to pupils are given largely by numerous 'sequence pictures' because it proved largely impossible to convey adequately in a second language the complex space-time descriptions necessary to scientific explanations and instructions and that with English students too, comprehension of what to do and how to do it was faster by the multiple sequence picture method."

23. Summarizing then, we find that in part, comprehension of pictures with social meaning or pictures showing a number of connected items such as a landscape, is dependent on a process of maturation common to all children. But if a picture is complex, many non-literate people do not understand it unless their attention is directed in such a way that they notice the significant, critical detail. For this reason each stage in a process or a story must be shown separately in a close step sequence. Apparently, people unsophisticated in using pictorial material do not 'skip read'.

* Comprehension of Pictorial Symbols: an Experiment in Rural Brazil. Luiz Fonseca and Bryant Kearnl. College of Agriculture, University of Wisconsin, 1960.

SECTION 3

Understanding or 'reading' Schematic Representations

(Diagrams, organisational charts, maps, technical drawings)

24. In his long essay on communicating with illiterates, A. Fuglesang argues that certain concepts, on which the scientific approach to problem solving is based, do not exist among illiterates. He concludes from the tests carried out in Zambia that concepts of the conservation of mass, number and of area do not exist or are unstable, as are the concepts of a straight line, horizontality and verticality among illiterates. In general the determining factor for the development of such concepts is the educational stimulation of the environment and where the stimulation is lacking the basic symbol processes are lacking.

25. It may further be argued that some concepts do not exist in the language of the people. For example, there are in Lesotho, no concepts of area measurement and no generally used units of weights; while there are concepts of length and time these are based on units more situational than standard, varying according to what is measured, by whom and in what context. Sandra Wallman, the anthropologist who worked in Basutoland in 1963, reporting in Human Organization Fall 1965 Vol.24, No.3 on the communication of measurement in Basutoland (now Lesotho) where the problems of communicating with people whose conceptual framework is different from that of the person designing visual material, observes that "the tendency is to expect them to learn our way, to expect the illiterate peasant to adapt himself to the schooled man's thinking". Brian du Toit, of the Department of Anthropology at the University of Cape Town, argues strongly that language, itself a product of a culture, influences what the speaker perceives and the way in which he perceives it.

26. M.B. Goller working on programmed learning in Rhodesia, found that for African children the transition from the intuitive stage to the concrete operations stage as defined by Piaget, is unduly delayed, undoubtedly because they are compelled to live in surroundings which lack many experiences provided at home for children of the same age in other countries.* Thus if the type of concept formation that is necessary for scientific thinking and for the understanding of abstractions is lacking, the failure to understand a visual statement may be due not to a failure of perception but of thinking.

27. Professor P.A. Duminy points out in African Pupils and Teaching Them, published by J.L. van Schaik (Pretoria) in 1968 (page 70) "that the Bantu child, as the result of his being tied down to the concrete from his tenth year onward, does not readily develop more analytical and systematic thinking as is common with the European child. There is a handicap in the development of thought into the more abstract levels of consciousness. If this is so, the most important reasons will be the nature of the environmental influences, lack of sound didactical methods during early years at school, and language factors."

28. Studying the development of spatial concepts in Zulu children between five and twelve years of age, J.J. Cowley and M. Murray found that the

* Quoted by D.G. Hawkrige in Programmed Learning and Problems of Acculturation in Africa.

performance of the Zulu children was below that of the white children, though a similar sequence of development was present. Whether using cardboard models, pictures, questioning or drawing, the difference was marked. The authors accept that the language structure of the cultural group may influence and sometimes limit the ability of that group for logical thinking, but urge that by studying children's own representation of the environment the development of a culture can be followed and observations can be systematized. On closer study we find that the development of concept formation and understanding of spatial relationships are subtly interwoven with the effects of social environment as a whole, especially in the early years of childhood. Language is of course part of that environment. In an essay on Cultural Variations in Cognitive Skills published in Cross Cultural Studies edited by D.R. Price-Williams, (Penguin Books 1969) J.J. Goodnow concludes on page 256 that "one of the sharpest differences among cultural groups may lie in tasks where the child has to carry out some spatial shuffling or transforming, in his head, without the benefit of actually moving the stimulus material around. People with little formal schooling in the Western sense often make great use of action and direct manipulation of material and this may account for the well developed sense of spatial relationships among Eskimos." In his study Intelligence and Cultural Environment published by Methuen, in 1969, Professor P.E. Vernon concludes on p.217 that "certain types of visual discrimination are strengthened in environments where they are important for survival. Perceptual development seems to depend to a greater extent on social norms, education and acculturation. The deficiency which many African peoples have in interpreting three dimensional pictures and with analytic perception of figures is not found among quite backward groups of Eskimos. The explanation seems to lie in lack of visual kinaesthetic-experience and of encouragement of play and exploration throughout childhood, though it may be remediable by appropriate training."

29. As earlier, we may profitably note some general conclusions about visual aids put forward by M.D. Vernon. On pages 112 and 113 of Psychology of Perception (Penguin Books 1962), she points out that "it is customary to show children pictorial charts illustrating successions of historical events; or related geographical features; or technical processes in science or in manufacture. The meaning of these is not always obvious to the children. Many of the charts used in schools are too crowded and complicated for children to understand even after they have been explained."

30. Yet, accepting that teachers frequently misjudge the ability of children to understand either the concept or its schematic representation, Hawkrige finds that in addition Central African children have a particular disability relative to European children with respect to schematic presentations. In the course of empirical testing and revision of a linear programme on Simple Contours, designed to teach African pupils in the first year of secondary school to read simple contour maps, he found the verbal aspects of the programme were successful but that the visual aspects were significantly less so. The final objectives were to draw a cross section of simple vertical land forms, for example a conical hill, and to translate into words a two-dimensional contour representation of a three dimensional land form, (the conical hill). The majority of the African pupils could not identify the sketch nor could most of them draw a reasonably correct simple cross-section, but a significantly greater proportion of European pupils were able to deal successfully with these questions in the programme.

31. The indications are that through environmental factors operating from the earliest years, these pupils had not developed the capacity, required

in these schematic presentations, to translate the two-dimensional diagram into three-dimensional "pictures in the mind". Seeking experimental evidence in support of such an hypothesis, we find the seminal work of Dr. W. Hudson. In 1960 he completed the first of a series of studies on pictorial perception with the objective of examining the responses of various cultural groups in Africa to representational cues in depth. His findings were published in some detail in the *Journal of Social Psychology* in 1960 and discussed at the Scientific Council for Africa South of the Sahara conference in Lagos in May of the same year. The conference paper was published in *Psychologia Africana* in 1962, in an article entitled Pictorial Perception and Educational Adaptation in Africa. A later paper, The Study of the Problem of Pictorial Perception among Unacculturated Groups, published in *International Journal of Psychology* in 1967, draws on the same experimental data and correlates them with findings from some other studies. His evidence is conclusive and unequivocal - the perceptual determinants are cultural, not educational. Formal education has a contributive function, but is subordinate to other cultural factors in the environment. Dr. Hudson maintains that informal instruction in the home and habitual exposure to pictures play a much larger role in developing pictorial depth perception than schooling does.

32. Following Dr. Hudson's lead and using four of the pictorial depth perception tests devised by him, A.C. Mundy-Castle studied the problem among Ghanaian children aged between five and ten years and came to the same conclusion - that cultural stimulus is critical for the development of pictorial depth perception.

33. The readiness to 'see' three dimensionally is of great importance in many stages of "Western" learning and particularly so in applied arts, building trades, and all manner of technical crafts. As indicated above, attention has been paid since 1960 to the ability of African pupils to understand drawings intended to be seen three dimensionally. More recently, Jan B. Deregowski using the tests devised by Hudson and, in addition, a set of drawings from which his subjects were asked to construct little models of bamboo splints and plasticine, came to the conclusion that the inability of his Zambian school boys and house servants to construct correct three dimensional models could not easily be attributed to lack of manual dexterity. We would agree; after seeing the film Toy Making in Africa* (available from Professor L.J. Lewis, University of London Institute of Education) there can be no doubt that boys in Central Africa at any rate, have high manual dexterity. The Zambian pupils and adults recognized the three dimensionality of the drawing but distorted the relative arrangements of the diverse parts. "Hence it may well be that the subjects do not fail to see depth because they fail to recognize the depth cues as such, but rather because, whilst looking at the pictures, they restructure them by allocating lesser importance to depth cues than to other elements". Dr. Deregowski goes on to suggest that if these cues are given sufficient prominence in the drawing the learner pays attention to them and they are taken into account though the objects in question may be novel to the learner.

34. Two further indicators of the importance of this aspect of depth perception and the compensatory educational provision that can be made where it is desirable to develop the skill, come from the work of Schwartz and of Dawson. P.A. Schwartz developed aptitude tests for use in developing nations. In the course of his work he modified a test called Three-Dimensional Visualization test into the Boxes Test, described in a paper published in

* This shows models of trains and motor vehicles made by boys, out of bits of wire.

1964. The person being tested has to visualize cubes drawn flattened out, which is closely related to the reading of technical diagrams, and the evidence from the work Schwartz did in Malawi suggests that pictorial perception must be explicitly taught. In support of this notion we find the evidence submitted by J.L.M. Dawson in a doctoral thesis (Oxford University 1963) that pupils given a six month training period in three dimensional perception improved dramatically in their ability to 'read' pictures of this kind.

35. To sum up, it is generally accepted that environmental factors including language, operating from the earliest years, may retard conceptual development including spatial abilities, vis a vis Western 'norms'. For this reason, diagrams and three dimensional technical drawings are not understood. But special training in spatial perception, may remedy a situation which makes the adaptation to a technological society difficult.

SECTION 4

Understanding Symbolic Pictorial Presentations (e.g. Posters)

36. For various practical reasons it is difficult to conduct controlled researches into the effects of posters and other symbolic pictorial representations on non-captive audiences such as farmers. Yet posters composed of visual symbols are widely used to communicate with non-literate adults in many parts of the Commonwealth. The difficulties were made explicit in the evaluation of the cocoa campaign carried out in Ghana in 1954 and 1955 reported in a mimeographed document presented by M.L. Clarkson to the Ghana Social Welfare Department in 1956. "Illiterate people are unwilling to be troubled by a series of questions of which they do not see the point and the replies they give are unreliable; anything to please the questioner or get rid of him. At the same time we needed some guidance as to which kind of poster, picture or slogan was most effective and which did not convey any meaning or make any appeal". Exactly.

37. The team investigating ways of finding out about aesthetic perception in North East Thailand came to a similar conclusion, finding that villagers had short attention spans in formal testing and interview situations and had little free time available. During planting and harvesting the entire village was engaged in agricultural pursuits in the day time and at night the illumination was poor. During the slacker periods in agriculture, festivals and social activities filled the days and proved distracting to any concentrated testing or individual viewing.

38. For these and other reasons, there is a paucity of published material on the effects of symbolic visual presentations on people of a low level of literacy. Yet some research has been conducted, notably in Southern and East Africa.

39. Of some interest is the report emerging from the work of W. Hudson and H. Hector who investigated the usefulness of safety posters designed for Bantu industrial workers by the National Occupational Safety Association in Johannesburg, Republic of South Africa. In the abstract of the report published by Wendy Winter, it is concluded that human behaviour should be depicted in accordance with Bantu tradition and that superimpositions intending to represent depth or movement are unsuccessful because conventional depth cues cause confusion. Hudson and Hector also found that symbolic meanings were often attached to colours and shapes, which frequently distorted the intended meaning.

40. Fonseca and Kearl, working in rural Brazil, reported that people of limited education tended to give the most literal interpretation to any symbols that have both a literal and figurative meaning. Holmes inspired by the Brazil findings, studied the responses of urban youths and women in Kenya. He found, as noted earlier, that they were confused by too much detail, yet needed realistic portrayal to get meaning from a health poster. More significantly, pictorial symbols were interpreted literally. A further example of this phenomenon is reported in Advance October 1961 in an article by the Department of Social Welfare and Community Development in Ghana (page 58). Posters intended to encourage all the physically handicapped to register, resulted in only men appearing since the poster had not shown any women.

41. Many examples of such literal interpretations of pictorial representations which have symbolic meaning, are quoted by workers from all countries. Posters are seldom designed by indigenous artists and, even when they are, most of the artists have been trained to adopt an exotic style of drawing and to apply symbolic forms not recognized by the indigene. Furthermore, posters are designed to be shown to the general public, without differentiating between levels of acculturation, or urbanization. What is pictorially meaningful at one level of acculturation may be meaningless at another. The meaning of a picture or poster is always related to the viewer's own pre-occupations, interests and experience. Before designing any mass communication tool, there should be research into the local traditional and social symbolism especially when the message is not accompanied by a verbal face-to-face explanation. Messages are sent through media and visual media which do not use words at all are better avoided. "A-V materials are most effectively used as aids to words with illiterates; the spoken word is to this extent essential", is the considered judgment of Evelyn Wood who for many years has studied the effects of different audio visual media with illiterate people of India (Taken from a mimeographed paper distributed from 5 Sobani Road, Cuffe Parade, Bombay 5 in March 1960) Hudson and Hector, too, found that when the safety posters were explained with oral instructions, understanding increased by 50 per cent.

42. There are few controlled researches on how posters or large pictures are perceived by illiterate adults. The work of Hudson and Hector in South Africa (1963) of Fuglesang in Zambia (1969) and that of Holmes in Kenya, echoing that of Fonseca and Kearnl in Brazil are the sum of those we can refer to. Other observations do however exist, based on field experience of campaign workers, which in their cumulative effect provide valuable guide lines to production. For example the 1954 - 1955 campaign, carried out in Ghana to persuade cocoa farmers to deal with the plague of swollen shoot, included the use of posters. The effect of eight of these was evaluated among three groups of farmers and the general conclusion was that posters should be treated as teaching aids. They made little impact when stuck up by themselves although villagers often liked to have them for various other reasons.

43. Some further guide lines emerge from the field testing of pictorial materials for new literates, as reported in Communication through Educational Materials edited by Seth Spaulding in 1955 for the Burma Translation Society, and the Unesco Group Training Scheme for Fundamental Education in An experiment in teaching adults to read and write. Both of these are summarized in Literacy Primers: construction, evaluation and use by K. Neijs published by Unesco in the series of Manuals on Adult and Youth Education No.2. (Yelwal, Mysore, India 1955). Seth Spaulding and John Bowers conducted a Unesco workshop on preparing material for new literates in Kenya in 1962 in the course of which some illustrations were field tested. The work is reported in Manuals on Adult and Youth Education No.3, Simple reading material for adults: its preparation and use published by Unesco in 1963.

44. It seems that few general conclusions can be drawn with regard to the use of pictorial symbolism for communicating new ideas, largely because of the grave methodological deficiencies in the studies thus far reported. It can safely be said however, that great social sensitivity and deep knowledge of the symbolic system of the community are essential pre-requisites for artists who design posters, if they are to communicate effectively with non-literate people.

SECTION 5

Studies mainly of Interest to Theoretical Psychologists

45. Early in this century during an expedition to the Torres Straits, W.H.R. Rivers did some experimental work on the perception of geometric illusions among the Todas people of that region. Since that time other workers have investigated the extent to which geometric illusions are universally perceived. Most extensive of these studies is the work carried out by Segall, Campbell and Herskovits over a period of six years administering tests to 1878 people in widely dispersed groups - in different parts of Africa, one group in the Philippines, an American undergraduate group and some adults in Illinois. Analysis of the data shows strong cultural differences. They put forward the view that the Müller-Lyer illusion is a function of rectangularity in the environment and that the Vertical-Horizontal one depends on openness of terrain. Yahoda tested this in Ghana in 1966, confirming the findings on the Müller-Lyer illusion but not on the Vertical-Horizontal. On the other hand, Morgan tried the Herskovits materials on illiterates from different tribal African groups and on a European group in South Africa and did not find consistent differences. She considers that more research is necessary before an hypothesis can be put forward to account for the differences which have been shown to exist.

46. Bowden and Schwitzgebel both investigated perceptual discrimination and both suggest compensatory educational measures are necessary, with the latter emphasizing that if these measures are applied later rather than earlier some perceptual skills may not be re-acquired even after extensive education.

47. Some studies of phenomenal regression are reported by Beveridge who considered that Africans were less affected by visual cues than Europeans and that their tendency towards phenomenal regression is reflected in their art but his work has been overtaken by later studies which suggest that many of these phenomena are not isolated bits of behaviour. Rosslyn Suchman suggests that cross cultural studies of perceptual preference could throw light on thinking processes and lead to better understanding of cultural differences in cognitive processes.

48. Hector and Hudson in 1959, followed by Morgan and by Bradley in the same year, and Hector, Diodlo and du Plessis all studied the ability of literate and illiterate groups to construct recognisable representations by means of the 7-Squares Test material. Their work is reported in the Journal of the National Institute for Personnel Research, Vol.7 and Vol.8. Mental endowment and educational level have some effect, but maturation seems to be the most important factor. These studies, though of especial interest to theoretical psychologists, seem to have little immediate bearing on the practical problems of designing learning materials for school children and adults. Yet this type of fundamental research is important because each experiment throws light on aspects of perception and cognition which are culture bound and therefore susceptible of modification through the changes that will be wrought in society as technological advances are made manifest in people's daily lives.

CONCLUSIONS

49. That perceptual habits are largely determined by cultural and environmental factors seems to be firmly established throughout these varied and widely scattered researches. One further piece of experimental evidence, though assembled with other questions in mind, reinforces this conclusion. Dr. R. MacArthur, studying the correlation between 'field dependence' (as defined by Witkin et al, the field dependent person is one who orientates himself by reference to the environment, and whose perception tends to be global), and sex among the Eskimos, used the Embedded Figures Test which shows the ability to perceive a shape or figure that is embedded in a complex picture. It was a replication of an earlier investigation by J.W. Berry, and MacArthur concludes "this replication of Berry's findings for the Eskimo adds evidence suggesting that this ability to perceive embedded figures may be shaped largely by social or environmental influences. (Reported in Sex Differences in Field Dependence for the Eskimo: Replication of Berry's findings in International Journal of Psychology 1967, Vol.2, pp. 139-140).

50. W. Hudson summarises the position thus: "In a cultural group that has a normal range of intelligence, that in addition possesses high educational qualifications but is isolated from the dominant cultural norm, pictorial depth perception is not closely related to intellectual endowment or educational achievement. The critical threshold is cultural and not educational." (Hudson, W. Pictorial Depth Perception in Sub-cultural Groups in Africa reported in Journal of Social Psychology 1960, Vol.52, pp. 183 - 208).

51. Hawkrige and Duminy have both pointed out that the kind of education itself has an effect of reinforcing certain culturally established habits but that the influence of the social environment can be reduced by taking compensatory educational measures. Mundy-Castle in his paper on pictorial depth perception among Ghanaian children suggests that primary schooling in developing nations would be enhanced by the incorporation of specific training and informal experience in the perceiving, organising and handling of visual and spatial materials. Edgar Bowden points out in Perceptual Abilities of African and European Children Educated Together, that "The effect of making the environmental experience of Africans more like that of Europeans is always to reduce any observed differences in perceptual abilities."

52. Yet even when the environment of the school is the same, the pupils' experiences are not alike. For example, African pupils have fewer experiences with the conventional units of spatio-temporal measurement than have European children. Cole, working in Liberia, found that illiterate African adults and children who had not been to school were slow to learn to recognize such geometric figures as the circle and the triangle, suggesting that the African words available to describe them were inadequate because they failed to discriminate between, say, a circle and an ellipse.

53. Further, Dr. S. Biesheuvel, in an essay on psychological tests and their application to non-European peoples in The Year Book of Education published by Evans Bros. in 1949, drew attention to the fact that all the pictorial tests that had been used up to that time overlooked the fact that a picture printed on paper is a highly conventional symbol, which a child growing up in Western culture has already learned to interpret by the time he goes to school because he sees pictures from his earliest days and is encouraged to draw pictures himself. He also argues that "To make the object pictured culturally meaningful is of little avail, if pictorial

representation itself is unfamiliar and if it does not evoke the attitude of interpretation which a European group automatically assumes."

54. Dr. Biesheuvel's erstwhile colleague, Dr. W. Hudson, writing in the *International Journal of Psychology* in 1969, claims that "It is clear from the evidence obtained from systematic studies of pictorial depth perception and from observation of the drawings of black illiterates that the perceptual cues and representational conventions common in Western pictorial art provide problems of interpretation to the black man. Differences in objective and lack of meaningful exposure to the Western forms of art are largely responsible for these difficulties."

55. Hawkrige points out in Programmed Learning and Problems of Acculturation in Africa published in *Aspects of Educational Technology*, Vo.2, Methuen 1969, pp. 317 - 325. "The European pupils had apparently picked up enough in their previous formal and informal education to enable many of them quickly to learn to translate lines used two-dimensionally to represent masses in three dimensions; the Africans had not. The evidence generally shows that while literacy and numeracy may have been actually overlearned by the end of the primary school, other skills such as visual perception and some higher mental processes such as scientific thinking have been neglected in the African primary schools."

56. In his concluding remarks, to the Scientific Council for Africa South of the Sahara meeting of specialists on educational adaptation to African conditions held in Lagos in May 1960, Dr. Hudson examined the educational implications of his experimental work on perception from the point of view of the teacher. He asks for a critical approach when training methods which have worked satisfactorily in one cultural context are applied to another and different cultural group. Those that demand "parity of esteem", equality and uniformity of educational practice ignore the fact that culturally at the present time the Western world and Africa are not alike. Most of the existing educational systems and methods are rooted in European culture which is likely to need modification and adaptation for African peoples. He does finally concede that pictorial material is worth the time, money and effort needed provided it is appropriately designed for the particular group and conceived as a visual aid, not as an independent entity.

57. E.T. Abiola studied the pictorial representation made by Nigerian children of objects in their environment. He found, as many other observers have done, that pupils not exposed to Western art, drew what they knew, not what they saw. They used the 'Lascaux' perspective. He suggests that, given a developmental trend in the form of perceptual concepts and given that an analytical approach to objects becomes necessary in a community, then adequate exposure to representational materials and representational training should ensure the disappearance of the flat non-visual and didactic representations which are supposedly basic to the African. We find the same contention that schooling is a major factor influencing the ability to interpret visual presentation in the work of Fonseca and Kears* "Formal education sharply increases the ability to interpret pictorial symbols which: (a) have an extended or figurative meaning; (b) demand more capacity of abstraction; (c) are to be interpreted as a series telling a story; (d) are not necessarily related to the daily life experiences of the viewer".

* Comprehension of pictorial symbols: An Experiment in Rural Brazil by Luiz Fonseca and Bryant Kears published by College of Agriculture, University of Wisconsin, 1960.

58. However, Schwitzgebel sounds a less optimistic note about the effectiveness of compensatory educational measures. In 1962 he carried out comparative studies of white and Zulu students completing certain visual tasks. He concluded that specific perceptual organizations are culturally characteristic and environmentally dependent. But he also noted that some of the perceptual skills might not be attainable even after extensive education.

59. McFie suggests that in the general education of children in similar cultures to the one he studied in Uganda a particular stress should be placed on representational and constructional tasks - on the kind of subjects taught in technical schools. As long as constructional toys and other 'geometrical' tasks do not occur in their environment, their abilities in these respects will remain undeveloped and they will be handicapped in their attempts to deal with the representational and mechanical features of European culture.

60. The question now is one of feasibility. Can such training be provided in order to universalize learning materials?

61. Though working in the United States, the findings of Brinkman are relevant here. He tested the feasibility of programmed learning techniques to teach the visualization of space relations and concluded that the skill of individuals in spatial visualization can be improved when appropriate training is provided and by implication indicates that programmed learning techniques should be applied.

62. If such specific training is underpinned with enriched early experiences of manipulating shapes and carrying out constructional tasks, it is likely that many of the findings reported in this paper will not again be replicated, and that the perceptual deficiencies noted by Howard Poole will have disappeared from those societies that have adapted to modern technological organisation.

63. In the meantime designers of visual material from which children and adults can learn now, must take note of cultural, environmental, social and linguistic differences. Simplicity is the keynote, with illustrations based on those concrete and intellectual experiences of the learners which circumscribe their perceptual capacity.

Annotated List of Studies in Perception in Varied Cultural
Groups within the Commonwealth

1. ABIOLA, E.T.

Nigerian children's pictorial representation on objects in their environment
Teacher Education 1967, Vol. 7, No. 3, pp. 196-201.

Nine hundred unselected Nigerian children between 6 and 15 years of age drew various objects in the classroom; common observable characteristics were noted. There is a developmental trend in African children's drawings as with European, but it is masked by inadequate exposure to pictorial representation. The idea of differences in orientation between African and European is invalid. Given that an analytic approach becomes necessary in the community, then adequate training and adequate exposure to representational materials, should eliminate the flat didactic representations supposedly basic to the African.

2. BEVERIDGE, W.H.

Racial differences in phenomenal regression British Journal of Psychology
1935, Vol. XXVI, pp. 59-62.

Forty nine West African students studying drawing at a training college in Ghana (Gold Coast) were tested by the same procedure used by Dr. R.H. Thouless and results compared. West Africans have a higher index of phenomenal regression than Europeans which explains some peculiarities of their drawings.

3. BEVERIDGE, W.H.

Some racial differences in perception British Journal of Psychology 1938,
Vol. XXIX, pp. 57-64.

In finding out if African training college students in Ghana show a greater tendency than English students to phenomenal regression in the perception of brightness and whiteness, the author used material of Dr. R.H. Thouless to test 40 students. He found a greater tendency towards phenomenal regression than did Dr. Thouless in Scotland. It is reflected in African Art. Africans make less use of visual clues.

4. BIESHEUVEL, S.

Psychological tests and their application to non-European peoples The Year
Book of Education, Evans Bros. Ltd., 1949, pp. 87-126.

5. BONTE, M.

The Reaction of Two African Societies to the Müller-Lyer Illusion The
Journal of Social Psychology 1962, Vol. 58, pp. 265-268.

Using the form of the Müller-Lyer apparatus devised by Herskovits, the experimenter sought to determine whether differential susceptibility is affected by the mode of presenting the illusions. He found that when comparing 400 Bashi and 72 Europeans, the Africans were significantly less susceptible and more variable than the Europeans.

6. BOWDEN, E.A.F.

Perceptual Abilities of African and European children educated together
The Journal of Social Psychology 1969, Vol. 79, pp. 149-154.

Tests of visual discrimination were devised and administered to 200 children between nine and sixteen years of age, in four racially integrated schools in Kenya. There were small differences in perceptual aptitude. These were attributed to the small remaining educational and cultural advantages of the Europeans over their African counterparts.

7. BRADLEY, D.J.

The ability of black groups to produce recognisable patterns on the 7-Squares test
Journal of the National Institute for Personnel Research 1960, Vol. 8, pp. 142-144.

Ninety one schooled and eighty illiterate adults from diverse tribal groups in Southern and East Africa were asked to produce elephants using the 7-squares material. Neither educated nor uneducated groups were able to do this.

8. COWLEY, J.J. & MURRAY, M.

Some aspects of the development of spatial concepts in Zulu children
Journal for Social Research 1962, Vol. 13, pp. 1-18.

The administration Piaget and Inhelder's tests of spatial development were administered to a sample of 80 Zulu and white children between 5 and 12 years of age. The scores of the Zulu children are consistently below those of the white children. Topological, projective and euclidian relationships emerge at a later age in the Zulu than they do in the white children. Both groups follow the same sequence of development.

9. DEREGOWSKI, J.B.

Difficulties in pictorial depth perception in Africa
British Journal of Psychology 1968, Vol. 59, No. 3, pp. 195-204.

Hudson's Pictorial Perception Test and a construction test, shown in pictures, were administered to Central African schoolboys and domestic servants. Sixty subjects in each sample completed the two tests. Though a significant proportion of the 2-D perceivers on Hudson's test built 3-D models, they were distorted. Subjects appeared unable to organize the material presented in the test pictures.

10. DEREGOWSKI, J.B.

Investigation into perception Bulletin of the Institute for Social Research,
University of Zambia, Lusaka, Zambia 1966, Vol. 1, pp. 27-30.

One hundred and thirty eight Zambian candidates (school children and domestic servants) were asked to draw what they perceived of test materials. School children perceived in a three dimensional manner more frequently than did domestic servants.

11. DUMINY, P.A.

African pupils and teaching them Publication series No. 34 of National
Council for Social Research Department of Higher Education.
J.L. van Schaik, Pretoria 1968, Sections E page 65, F page 69 and G page 71.

The Bantu child and the importance of perception are discussed, drawing on research in this area. This is followed by an analysis of abstract thinking and then some comment on the use of audio-visual aids.

12. FRENCH, A.K.

A Background of Non-Reference Makerere Journal (Kampala Uganda) 1961.

The author discusses his observations of the ability of trainee teachers' at Makerere University of East Africa, Kampala, Uganda, to read Western European style diagrams, illustrations, practical instruction manuals. He concludes that their visual frame of reference is different from that of Europeans and this presents serious problems of adaptation to learning from Western style text books.

13. FUGLESANG, A.

Communication with illiterates mimeographed, The National Food & Nutrition Commission, P.O. Box 2669, Lusaka, Zambia 1969, pp. 54.

The first chapter is a theoretical discussion on the nature of the communication process. In chapter II he describes how he tested 75 illiterate adults, using perception tests in the style of Piaget and pictorial tests of degrees of realism. Then follows further analysis of the basic problem of communicating with non-literates. He concludes that certain basic symbol processes of conservation items are lacking and that certain details are necessary for recognition of pictorial representations.

14. HAWARD, L.R.C., & ROLAND, W.A.

Some intercultural differences on the Draw-a-man test: Goodenough Scores Man. June 1954, pp. 86-88.

Thirty Nigerians and a hundred European adults were tested individually with the Goodenough material. The authors found the Nigerian samples scored low. They account for this apparent depression of mental age by the role of the tribal outlook and concreteness of mentation in effecting this difference. Their viewpoint is challenged in correspondence in the journal (Man) in September 1954 by four different correspondents.

15. HAWKRIDGE, G.D.

Evidence from Programmed Learning research in Central Africa National Society for Programmed Instruction Journal, Vol. VI, No. 8, October 1967, pp. 10-15.

Some of the work on programmed learning indicates that pupils attending African schools have difficulty in forming concepts about the representation of three dimensional objects in two dimensional drawings. His conclusions are based on validations of the programme. Simple Contours devised for pupils in secondary schools in Rhodesia.

16. HAWKRIDGE, D.G.

Programmed learning and problem of acculturation in Africa Aspects of Educational Technology, Vol. 2 published by Methuen & Co. Ltd., London 1969, pp. 317-325.

In this paper (contributed to a conference on programmed learning and educational technology, Glasgow 1968) the author describes the potential of programmed learning to improve pictorial perception and scientific thinking in primary schools in Africa. The difficulties that 600 Central African

secondary school pupils had in dealing with two questions involving pictorial depth perception in a programmed learning text on Simple Contours indicate the need for compensatory education in African schools.

17. HAWKRIDGE, D.G., & MICHIE, W.D.

Simple Contours University of Rhodesia, Salisbury 1966.

A linear programmed text devised to teach African pupils in the first year of secondary school to read simple contour maps.

18. HECTOR, H., DLODLO, M.S., & du PLESSIS, C.F.

An experiment on silhouette recognition and projection with Bantu children of different ages Journal of the National Institute for Personnel Research 1961, Vol. 8, pp. 195-198.

Using modified 7-Squares test, the ability of 295 Bantu children to recognise representational silhouettes was shown to improve with rise in age, but the readiness to "project" objects into non-representational silhouettes decreases with rise in age.

19. HOLMES, A.C.

Health Education in Developing Countries Nelson 1964, pp. 190.

The author suggests ways of teaching health, basing his guiding principles on his observations, experiences and investigations in East Africa. In Chapter four, he is concerned with pictorial aids to teaching good health; the author quotes from his own studies of pictorial perception in Kenya and indicates the application of his findings to the design of visual aids for teaching health.

20. HOLMES, A.C.

A study of understanding of visual symbols in Kenya Overseas Visual Aids Centre 1963, pp. 32.

The ability of people in and around Nairobi and other townships to interpret visual symbols was tested. About 1500 replies were analysed. Compression of a process into one or two visual statements leads to misunderstanding. Too much detail makes correct interpretation difficult, as does enlargement. The lower the educational level, the more literally will symbols be interpreted.

21. HUDSON, W.

Colour v monochrome in a demonstration film used to administer performance tests for the classification of African workers Journal of National Institute for Personnel Research 1958, Vol. 7, p. 128.

A black and white film is normally used to help African industrial workers grasp the essential working principles of each item in the occupational classification performance tests. A colour film of one of the tests was made and tested on 147 candidates. There was no difference in mean performance of two sample groups. Colour is unnecessary.

22. HUDSON, W.

Pictorial depth perception in Sub-cultural groups in Africa Journal of Social Psychology 1962, Vol. 52, pp. 183-208.

A series of tests, consisting of outline drawings and a photograph of a

model scene, were constructed so as to depend perceptually on the cues of object size, overlap and perspective. These were applied to eleven sub groups in South Africa to test their ability to perceive three dimensionally. The groups differed in educational level and cultural environment. The conclusion is that formal education, which had been hypothesized as decisive, has only a contributive role in the development of pictorial depth perception and is subordinate to other cultural factors. Pictorial depth perception is learned but the process can be retarded or prevented by cultural environment and intellectual endowment.

23. HUDSON, W.

Pictorial perception and educational adaptation in Africa *Psychologia Africana* 1962, Vol. 9, pp. 226-239.

This paper was first contributed to the C.S.A. meeting of specialists on educational adaptation to African conditions in Lagos, 1960. The author reports on his studies of depth perception and concludes that the implication for the teacher is that a critical approach is necessary when training methods which have worked well in one cultural context are applied to another, different cultural group or sub cultural group.

24. HUDSON, W.

The study of the problem of pictorial perception among unacculturated groups *International Journal of Psychology* 1967, Vol. 2, pp. 90-107.

A survey of the recent work done in Africa and elsewhere on the perception of pictorial material with a view to summarizing the findings and relating them to the communication problems of the educator. The author's conclusion is that provided pictorial material is appropriately designed for particular groups and used as an aid to communication it is worth the cost in time, effort and money.

25. JAHODA, G.

Geometric illusions and environment: a study in Ghana *British Journal of Psychology* 1966, Vol. 57, pp. 193-199.

Two hundred and thirteen Ghanaian subjects in different terrain were tested to investigate the Segall et al hypothesis that geometric illusions are a function of environment and terrain. The Müller-Lyer hypothesis was confirmed but not the Vertical-Horizontal.

26. McFIE, J.

The effect of education on African performance on a group of intellectual tests *British Journal of Educational Psychology* 1961, Vol. 31, pp. 232-240.

On entering technical school, 26 Ugandan boys were given a series of intelligence tests which included pictorial and constructional material. They showed differences from English boys in their inaccurate orientation of drawn and constructed designs. After two years' training, significant increases in scores were noted suggesting that the abilities that are poorly developed under their cultural conditions may be increased by appropriate educational methods.

27. MORGAN, P.

Observations and findings on the 7-squares test with literate and illiterate black groups in Southern Africa *Journal of the National Institute for*

Personnel Research 1959, Vol..8, pp. 44-47.

Fifty clerks and 50 illiterate mine workers were asked to arrange the 7-squares material in any way that was pleasing and then to state what the shapes represented. Neither group was able to make a recognizable design, but the literate group made more orderly designs.

28. MORGAN, P.

A study in perceptual differences among cultural groups in Southern Africa using tests of geometric illusion Journal of National Institute for Personnel Research 1959, Vol. 8, pp. 39-43.

Using the Herskovits' material, she tested the illusions among illiterates from two tribal groups (70 & 46) and compared their responses to those of a white group (44). Differences were found but they were inconsistent. More research is needed before an hypothesis can be formulated.

29. MUNDY-CASTLE, A.C.

Pictorial depth perception in Ghanaian children International Journal of Psychology 1966, Vol. 1, pp. 290-300.

Using four pictures from Hudson's Depth Perception Test, 122 children who had attended primary school from their fifth year, were studied. Results comparable to Hudson's were obtained and the conclusion is that the cultural stimuli are critical for the development of pictorial depth perception.

30. NEIJS, K.

Literacy primers. Construction, evaluation and use Unesco 1966, pp. 113.

Unesco. Simple reading material for adults: its preparation and use Unesco 1963, pp. 95.

31. POOLE, H.

Restructuring the perceptual World of African children Teacher Education in New Countries 1969, Vol. 10, No. 2, pp. 165-172.

In order to test if the spatial abilities of African children could be substantially modified through communication in a suitable environment, four ten-year old Nigerian boys from a semi-rural community, spent 38 sessions (during 8 weeks) of about 1 hour's duration, playing with and talking about spatial enrichment materials. The results suggest that such modification could occur, especially if younger children are given concrete social communication in an enriched environment.

32. PRICE-WILLIAMS, D.R. (ed)

Cross-cultural Studies: Selected Readings Penguin Books, Middlesex 1969, pp. 384. Excerpts from previously published papers are given in five parts. Part III Visual Illusions and Part IV, Pictorial Depth Perception are of especial interest.

33. SEGALL, M.H., CAMPBELL, D.T. and HERSKOVITS, M.J.

The Influence of Culture on Visual Perception Bobbs-Merill, Indianapolis 1966, pp. 268.

This describes work, spread over six years, testing the responses of culturally diverse groups to four optical illusions - the Müller-Lyer figure, the Sander parallelogram, and two forms of the Horizontal-Vertical figure.

Each respondent had to judge in 39 cases which of two lines was longer. The responses were not uniform. Differences arise from factors in the environment which may or may not be related in part to technological development.

34. SHAPIRO, M.B.

The rotation of drawings by illiterate Africans Journal of Social Psychology 1960, Vol. 52, pp. 17-30.

The results are reported of the performance of 20 illiterate Africans and 17 educated Africans (in the then Central African Federation) on a shortened form of the Drawing Rotation Test, compared with low and high grade, normal and brain damaged English people. The illiterate Africans rotated significantly more than any other group, in accordance with precise laws of organization.

35. SHAW, B.

Visual Symbols Survey. Report on the recognition of drawings in Kenya African Medical and Research Foundation 1969, pp. 54.

Fifty seven drawings were prepared by Alan Holmes on cards. These were tested on 1123 urban people in Kenya, no one person being asked to recognise more than 18. Later, a rural Survey covered a further 377. Age, sex and education were noted. Another set of 17 drawings of objects grouped into composite pictures was tested on 1352 children. The results were inconclusive; for example, putting objects into a context sometimes increased and sometimes decreased the chances that they would be recognized. It does appear, however, that schooling increases ability to recognize drawings of objects.

36. SCHWARTZ, P.A.

Aptitude tests for use in the developing nations and Development of manpower screening tests for the developing nations American Institutes for Research, Pittsburg 1961 & 1964.

Both these papers discuss the use of the Three Dimensional Visualization Test. The latter includes the Boxes Test used by Schwartz, MacArthur, Nicole and others in nine African countries in selection procedures designed to test for technical skills.

37. SCHWITZGEBEL, R.

The performance of Dutch and Zulu adults on selected perceptual tasks The Journal of Social Psychology 1962, Vol. 57, pp. 73-77.

A series of visual and cognitive tasks was presented to young Zulu and Dutch South African adults. The greatest difference was the difficulty the Zulus had in locating an embedded geometric figure. Even relatively simple processes may be affected by environmental conditions and some of these perceptual skills may not be re-acquired even after extensive education.

38. STACEY, B.G.

Cultural basis of perception Science Journal, December 1969, pp. 49-52.

The author draws on some published researches of J.L.M. Dawson, J.B. Deregowski, W. Hudson, A.C. Mundy-Castle, M.H. Segall and M. Wober, to argue that the manner of perceiving is culturally determined.

39. SUCHMAN, R.G.

Cultural differences in children's color and form preferences The Journal of Social Psychology 1966, Vol. 70, pp. 3-10.

Investigating color versus form preference of 120 Moslem Hausa children in Zaria, Nigeria, the author found that preferences for color over form continued into adolescence. It is suggested that a study of perceptual preference could throw light on cultural differences in cognitive processes. Color preference is not an isolated bit of behaviour.

40. du TOIT, B.M.

Pictorial depth perception and linguistic relativity Psychologia Africana 1966, Vol. 11, pp. 51-63.

This is a discussion of Dr. W. Hudson's tests regarding the ability of Bantu to perceive three dimensionally. The author suggests that one of the explanations for Hudson's results is linguistic relativity. Language can be a screen for cognition. Language influences what the speaker perceives and the way in which he perceives it.

41. UNESCO

Group Training Scheme for Fundamental Education. Report of an Experiment to Assess villagers' understanding of Book Illustrations mimeographed 1954 in Mysore, India by Unesco Group Training Scheme.

42. VERNON, P.E.

Intelligence and Cultural Environment Methuen & Co. Ltd., London, 1969, pp. 237.

Cross cultural studies are described in Chapter V. These include accounts of testing for a variety of skills and aptitudes, including perceptual, among Jamaican, Ugandan, Canadian-Indian and Canadian-Eskimo school children. Variety of perceptual skills are displayed; for example, Eskimo children have high spatial aptitude but Ugandans do not. Reasons for the differences are discussed. Perceptual development seems to depend on social norms, education and acculturation.

43. WALLMAN, S.

The communication of measurement in Basutoland Human Organization, Fall 1965, Vol. 24, pp. 236-243.

Many measurements are meaningless even to agricultural demonstrators and extension workers. All concepts, including the simplest technical ideas, must be translated and interpreted. Posters are often misunderstood for lack of such interpretation.

44. WINTER, W.

The perception of safety posters by Bantu industrial workers Psychologia Africana 1963, Vol. 10, pp. 127-135.

The effectiveness of the message in 6 safety posters to 270 Bantu workers was studied by interview and questions through an interpreter. Urban Bantu understood better than men from rural environments. Educational level correlates with comprehension. Two-scene posters were confusing as were representations of depth and of moment. When the behaviour depicted did not accord with Bantu tradition, the poster was not understood.

Additional References used in the text

1. BRINKMAN, E.H.

Programmed instruction as a technique for improving spatial visualization
Journal of Applied Psychology 1966, Vol. 50, No. 2, pp. 179-184.

The author investigated the feasibility of using a specially designed self-instructional program to teach visualization of space relations by administering a 505 item program to 27 eighth graders. A significant improvement was found.

2. BUSINESS RESEARCH LTD.

Aesthetic perception of villagers in North East Thailand United States
Operations Mission to Thailand, pp. 228.

A Bangkok firm Business Research Ltd. carried out a study to develop a methodology for obtaining data on aesthetic perception in N.E. Thailand. More than 1000 villagers were interviewed about their assimilation of prepared visual materials. Rapport with villagers is best gained through an extended stay; knowledge of local dialect is essential, and villagers could not rate materials on more than a three point scale. Children's drawings showed that they use distinctions of dress more than anything else to distinguish people of different occupations and status.

3. COLBORNE, H.V., & SHEPPARD, D.

Testing a poster for infants Safety Education Summer 1966, pp. 8-11.

Fifty five children aged 5-7 were interviewed and tested in two groups with two designs for a poster. They failed to get the message and it is suggested that presentation in the form of a series of pictures may make understanding easier for the children.

4. FONSECA, L., & KEARL, B.

Comprehension of Pictorial Symbols: an Experiment in Rural Prazil College
of Agriculture, University of Wisconsin 1960, pp. 28.

Comprehension of a number of pictorial symbols was tested among a group of people aged between 8 and 19 years in the state of Minas Gerais, Brazil, marked by highly traditional routine of living and a general lack of educational opportunity. It was found that unless symbols are realistic and of known objects they are not recognized. Complex statements are not understood. Education sharply affects ability to comprehend.

5. SPAULDING, S.

Communication potential of pictorial illustrations Audio Visual Communication
Review Winter 1956, Vol. 4, No. 1, pp. 31-46.

An evaluation was carried out in three areas of Costa Rica and three areas in Mexico to test the overall communication potential of twelve of the illustrated booklets prepared for new literates by Pan American Union's Latin American Fundamental Education Press. Ninety eight people were tested with a total of 2138 separate illustrations. It was found that only realistically portrayed objects of which the readers had had experience, arranged in as simple a way as possible were understood.

6. SPAULDING, S.

Research on Pictorial Illustration Audio Visual Communication Review Winter 1955, Vol. 3, No. 1, pp. 35-45.

The author reviews selected research in pictorial illustration. He draws generalizations of importance to educators.

7. VERNON, M.D.

The psychology of perception Penguin Books 1962, pp. 265.

A collated study of what and how we perceive. Special emphasis is given to interpreting the findings of research and showing their application to teaching situations.

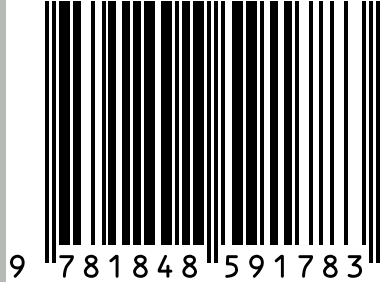
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