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ems. Today the resources for training, research, and production are fragmented. If it were somehow possible to concentrate these resources, schools and research institutes could move into key positions.

Instruction in lettering and typeface design in today's art schools is often insufficient and only skims the surface. There are still many unsolved problems. Plans are underway to establish a special advanced program for lettering at the Kunstgewerbeschule in Basel. A comprehensive study of all facets of script design would be offered; research and experiments would take up a major part of the training program. As today's script problems are of international importance, the special program in lettering is to become an internationally-oriented training center.

## Words in Color: Two Experimental Studies

Lillian R. Hinds and William G. Dodds

Development of the use of color as an initial added dimension in beginning-level reading is discussed, including the exploratory studies of the Gattegno Words in Color approach. Two experimental studies tested Words in Color: the Dodds study with primary-school children describes significantly superior scores in vocabulary and spelling; the Hinds study reports superior vocabulary and comprehension gains with inner-city illiterate adults.

The use of color in teaching is not new. As early as 1900, Nellie Dale in England employed color to highlight the language sounds: "red for vowels—important people; blue for voice-less consonants; black for voiced consonants."<sup>1</sup> By the mid-fifties, Hay and Wingo had popularized color to identify vowel sounds in a phonics program designed for use as an adjunct to a basal reader approach.<sup>2</sup>

In 1965 Kenneth Jones described the results of an investigation into the value of color as an aid to the visual discrimination of words and letters.<sup>3</sup> One hundred ten pre-school children were given four tests: (1) colored-letter test, (2) black-letter test, (3) colored-word test, and (4) black-word test. Half the children received the colored tests first then the black tests; the other half were first given the black tests and then the colored tests. All children were asked which they liked best, the colored or black

1. Morris, Ronald, *Success and Failure in Learning to Read* (London: Oldbourne Book Company, 1963), p. 47.

2. MacKintosh, Helen K., "Current Approaches to Teaching Reading," *NEA Journal*, LIV (December, 1965), 18.

3. Jones, Kenneth, "Colour As an Aid to Visual Perception in Early Reading," *British Journal of Educational Psychology*, xxxv (February, 1965), 21-27.

letters and words. The test results showed that matching the black letters and black words was at least three times harder than matching the colored letters and words. The superiority of scores in the color task was highly significant, and many children achieved the maximum score in color while only random scores were achieved in black. In addition, there was a strong preference in favor of the colored test material which undoubtedly affected test motivation. Neither age nor sex affected the results. The color alone was the critical factor here.

Teachers have also relied upon color as a stimulus for focusing attention of distractible children. The writers have seen teachers use this technique effectively. Petty and Burns used colored letters to introduce stories to tots of nursery-school age in England.<sup>4</sup>

Cuisenaire rods are a mathematical approach to learning in which color helps children to see the relationship between intensity in dimension and number value.<sup>5</sup> In fact, there is a planned relationship between the intensity of the color and the dimension of the rod. The colored rods enable the children inductively to learn quantitative relationships. This approach develops an awareness of process, freeing the learner to make discoveries through manipulation of colored rods of varying sizes.

Dr. Caleb Gattegno saw the possibilities of the impact upon learning and employed this concept to the sound-symbol language relationship. He initiated an approach to beginning level reading which was named Words in Color.<sup>6</sup> He tried to capture the same memory principle that Cuisenaire had applied to arithmetic relationships. This same principle is used by poets, musicians, and artists to recapture images. Wordsworth, for example, in discussing thoughts recollected in tranquility, described this phenomenon in reference to the garden of daffodils:

4. Petty, Walter T. and Burns, Paul C., "A Summary of Investigations Relating to the English Language Arts in Elementary Education: 1965," *Elementary English*, XLIII (March, 1966), 258.

5. Sisters Mary Judith and Marie Anthony, Cuisenaire Company of America, Inc., 1962.

6. Gattegno, Caleb, *Teacher's Guide, Words in Color* (Chicago: Encyclopedia Britannica Press, 1963).

For oft when on my couch I lie  
In vacant or in pensive mood,  
They flash upon that inward eye  
Which is the bliss of solitude;  
And then my heart with pleasure fills,  
And dances with the daffodils.

Words in Color, by presenting the words in the multi-colors which make up the whole word, stimulates the total recall of the colored image as one recalls the graceful, swaying yellow daffodils. This is visual imagery recall.

As opposed to the pure memory recall employed when one remembers a telephone number, Gattegno was seizing upon the idea of a holistic or gestalt approach to aid the kind of recall to which Wordsworth referred. In addition, Gattegno employed color cues which permit a visual image recall of a scene, which in this case is words. In this case, unlike the Cuisenaire rods, the particular choice of color followed no special plan or rationale. Individual color selections were significant as the yellow in "u" and a similar but deeper yellow in the schwa which is the unstressed "uh."

Words in Color employs color to codify 47 sounds of our language. It does this without in any way altering the basic structure of the language. In contrast to i.t.a., no artificial symbols are used to substitute for non-phonetic spellings of the language. Color serves as the initial visual cue to trigger the response in the mind of the learner; with i.t.a. 16 contrived characters are used.

Eight wall charts present in color the 47 sounds and over 270 graphemes of the phonic code. For example, the a appears in white on the first phonic code, column one. The irregular spellings for this same sound also appear in white. Color, then, reduces to a phonic consistency the sounds of the English language, for color here replaces the need to change spellings or to introduce diacritical markings.

The person who is confused by the many spellings for a single sound and the many sounds for a single spelling can sort out the forms and sounds by his initial color cue. Color reinforces both his auditory and visual imageries; for example, the underlined parts of the following words all appear in white since the learner

emits the same sound in spite of the different spellings: pat, laugh, plaid.

When the child encounters the yellow color, he is stimulated to say ũ. Here again, the phonic code presents first the regular and then the irregular spellings as in the underlined portions of bug, done, does, young, flood, and was.

The pink ı column present ıt. This is a lengthy column as it includes among its many forms, busy, women, sieve, marriage, village, captain and been.

Light blue which evokes the short ě presented in the same color in the fourth column of the first phonic code is the underlined portions of the following words: pet, any, says, bury, said, and head.

The gold or short ǒ sound presented in the last column of the first phonic code begins with the regular form as in pot. Also included are John, honor, and knowledge.

Some sounds are presented in two colors. In the articulation of the word ouch, the speaker must say ah plus w; in this case he is blending two sounds, the purple ah and the blue-green w. The letter x appears in three different columns in various color combinations. These distinctions force the learner to be aware of precisely what sounds he is uttering; for example, the x which is yellow on top and apple-green on the bottom is the sound present in the word box. The x in exaggerate is gray on top and purple on the bottom. The x in anxious appears as yellow on top and blue on the bottom. Here, then, color insures the integration of the visual and auditory.

It is important to note, too, that color not only gives vivid cues to the learner, but it also serves to program systematically the learning in a structured and sequential way. The organized morphological approach provides the teacher with a planned sequence of lessons for presentation.

Vision specialists and educators agree that the morphology gives the learner a stable and unchanging code of organization and sequence, which helps lend security in the learning process. Color, through its stimulation, rivets and holds the attention of the learner. Among culturally disadvantaged people, where there is absence of color in their drab lives, the addition of color has a highly motivating effect.

What about the color-blind person? A totally color-blind individual sees distinctions even if only in gradations of gray—in different color intensity and proportion from the norm. Eight percent of all white males are color weak. Only two percent are totally color deficient. It is a sex-linked characteristic; girls carry the weakness, but possibly less than one percent of the females have poor color perception.

It is not the purpose of this paper to go into other psychological phenomena; we have limited our discussion to the typographical implications. What have been the results found with students initially learning by color as contrasted with approaches that do not use color? In Words in Color the problem of overdependence upon color is anticipated at the outset. Each sound group, printed in a separate color on the phonic code, is reproduced in the pupils' books in black and white. The pupils do written work in black on white. Color is used only as the initial cue. These cues are reinforced, however, by practice using colored chalk on black construction paper as new sounds are introduced. Thus, with consistent clues, images are evoked and maintained at the center of awareness.

In Words in Color the learner does not become dependent upon guessing words from context, a popular technique of the basal reader program. Nor is there dependence on picture clues; there are no pictures in the paper booklets that accompany the program. It should be noted, too, that letter names for the alphabet are not taught at the outset. This is postponed until the learner has a good understanding through color coding of the grapheme-phoneme relationships. Consonants are never sounded in isolation, as this also is contrary to Gattegno's approach. He emphasizes that by definition consonant means "to sound with."

#### *Research Designs*

Each of the writers employed Words in Color in studies to measure the effectiveness of this teaching method. One study was concerned with children at the kindergarten-primary levels; the other was with illiterate adults. Both were doctoral studies completed at Case Western Reserve University, Cleveland, Ohio, under the aegis of Dr. Mary C. Austin. Lillian Hinds' study is

"An Evaluation of Words in Color or Morphologico-Algebraic Approach to Teaching Reading to Functionally Illiterate Adults."<sup>7</sup> The study by William Dodds is "A Longitudinal Study of Two Beginning Reading Programs—Words in Color and Traditional Basal Readers."<sup>8</sup>

Hypotheses were stated in null form and evidence gathered to disprove the null hypotheses. The two-tailed tests were used because the writers did not wish to predict more than that there would be a difference. Because these were both exploratory studies, the interest was one of testing for difference—in any direction. The *t* tests were used to determine the significance of the difference between the means.

Conventional methods were used for instructing the control groups. In the kindergarten-primary study this was the popular traditional basal reader approach that is used in most American schools. The other study, with illiterate adults, used as its control a conventional method of teaching.

#### Evaluation

Statistical tests showed Words in Color to be a more effective language arts program. Highly significant differences were found by Dodds in word recognition skills and in spelling at the end of first grade (Tables I and II). These differences tapered off somewhat during the second grade but continued to be statistically significant. Mean comprehension scores for the Words in Color pupils were in every case higher than for those in the traditional program, although statistically significant differences did not appear in terms of comprehension skills with the primary children. In the study with adults, Hinds reported statistically significant differences for both mean vocabulary and comprehension scores in favor of the Words in Color group (Table III).

One of the most encouraging results of the kindergarten-primary study was the range of achievement of the Words in Color pupils at the end of first grade and again at the end of second grade. The bottom of the range was considerably higher

7. Unpublished Ph.D. dissertation, Case Western Reserve University, 1966.

8. Unpublished Ed.D. dissertation, Case Western Reserve University, 1966.

TABLE I. *Factors considered in a Comparison of 19 Elementary Pupils in Experimental Group and 19 Pupils in Control Group*

	<i>Experimental Group—Words in Color</i>	<i>Control Group Basal Reader</i>	<i>Standard Error of Means</i>	<i>t</i>	<i>Probability Level</i>
Chronological age (Months)	70.05	71.00	1.04	0.91	.40*
Reading Readiness (Percentiles)	90.89	92.28	3.42	0.40	.50*
Days of Attendance					
Kindergarten	174.15	189.38	1.90	2.52	.015
Grade One	178.42	179.63	2.49	0.49	.50*
Grade Two	176.18	174.86	1.42	0.93	.40
Intelligence Quotient	121.42	120.15	4.06	0.31	.50

\*Difference favored Control Group

TABLE II. *Mean Scores on the California Lower Primary Achievement Test at the End of Grade One for the Experimental Group and the Control Group*

	<i>Experimental Group—Words in Color</i>	<i>Control Group Basal Readers</i>	<i>Standard Error of Means</i>	<i>t</i>	<i>Probability Level</i>
Reading Vocabulary	3.00	2.50	.166	3.01	.002
Reading Comprehension	2.81	2.68	.246	0.53	.5
Reading Total	3.02	2.58	.186	2.42	.01
Spelling	3.82	2.84	.206	4.75	.0001

each time for the Words in Color pupils. For example, at the end of first grade, on the California Lower Primary Reading Test, the Words in Color range was 2.1 to 3.7 while the range of the control group with the traditional approach was 1.4 to 3.8. The simultaneous learning to read, to write, and to spell was clearly evident in the superior performance of the Words in Color students. Table IV shows that at the end of grade two, on an alternate form of the same test, the reading range was 2.5 to 4.0 for Words in Color and 1.9 to 4.0 for the traditional group. The test ceiling was 4.0. On a more difficult instrument, the California Upper

TABLE III. Summary of Contrast and Experimental Illiterate Adult Group Changes as Measured by the California Reading Test

Dependent Variable, Reading	Contrast Gain	Experimental Gain	t Value within Contrast Group	t value within Experimental Group
Raw Scores:				
Vocabulary	-1.085	7.774	-.491	4.111 <sup>b</sup>
Comprehension	-1.657	1.709	-2.031	3.664 <sup>b</sup>
Total	-2.742	9.483	-1.620	4.450 <sup>b</sup>
Grade Level Scores:				
Vocabulary	-.3027	.1363	-1.557	1.390
Comprehension	-.4648	.5454	-2.362 <sup>a</sup>	4.096 <sup>b</sup>
Total	-.354	.1696	-1.883	1.847

Chi Square Gain  
Difference between contrast and experimental group  $X^2 = 7.207$ , df 1,  $p < .01$

Notes:

- a = < .05
- b = < .001

TABLE IV. Mean Scores on the California Lower Primary Achievement Test at the End of Second Grade for the Experimental Group and the Control Group

	Experimental Group—Words in Color	Control Group Basal Readers	Standard Error of Means	t	Probability Level
Reading Vocabulary	3.40	2.95	.162	2.84	.004
Reading Comprehension	3.38	3.25	.224	0.58	.5
Reading Total	3.48	3.04	.148	2.97	.005
Spelling	3.93	3.52	.132	3.10	.003

TABLE V. Mean Scores on Color Upper Primary Test at End of Second Grade for Experimental and Control Groups

Test Section	Experimental Groups	Control Group	Standard Error of Means	t	Probability Level
Reading Vocabulary	4.52	3.94	.166	3.49	.0008
Reading Comprehension	4.15	3.97	.128	1.41	.08
Reading Total	4.25	3.99	.131	1.98	.03
Spelling	4.33	4.03	.151	1.99	.05

Primary Tests, also given at the end of second grade, the range of reading achievement for the Words in Color group was 3.6 to 4.6; for the traditional group the range was 3.1 to 4.7. See Table V.

Words in Color proved to be a highly successful beginning reading program that opened the door to learning for adults of the inner city of Cleveland. See Tables VI and VII. Poignant comments were made by some of these adults who described their deep satisfaction in learning to read. In terms of self-concept it would be difficult to measure what this achievement meant to these people.

The visual imagery and attention-holding assets of Words in Color at the initial stages of decoding, together with its constancy of columnar organization, helped to produce the significantly superior scores of elementary-age and adult students. In the case of the former, word recognition and spelling skills were significantly superior. Among the latter, word recognition and comprehension skills were significantly superior. No tests in spelling were given on the adult level. From a typography/visual standpoint, the added dimension of color appears to simplify the decoding-encoding process.

TABLE VI. Difference between Contrast and Experimental Illiterate Adult Groups

	Pass		Fail		Total	
	No.	%	No.	%	No.	%
Contrast Group	16	43.2	21	56.8	37	100.0
Experimental Group	25	75.8	8	24.2	33	100.0
Total	41		29		N=70	

$X^2 = 7.207$ , df 1,  $p < .01$

TABLE VII. Differences between Contrast and Experimental Illiterate Adult Groups on Measures of Intelligence, Auditory Discrimination, and Visual Function

Variable	Contrast Group		Experimental Group		Significance of Difference
	No.	%	No.	%	
<i>Intelligence</i>					
IQ under 80	6	35.3	23	69.7	$X^2 = 5.437$ , df 1, $p < .02$
IQ above 80	11	64.7	10	30.3	
Total	17	100.0	33	100.0	
<i>Auditory Discrimination</i>					
More than 4 errors (poor)	8	28.5	8	36.3	n.s.
4 errors or less (passable)	20	71.4	14	63.6	
Total	28	99.9	22	99.9	
<i>Visual Function-Fusion</i>					
Score 5 or less (fail)	5	15.6	12	36.3	$X^2 = 3.593$ , df, 1, p approximately .05 (.05 = 3.84)
Score over 5 (doubtful to pass)	27	84.4	21	63.7	
Total	32	100.0	33	100.0	
<i>Visual Function-Phoria</i>					
Score 5 or less (fail)	15	45.4	14	42.4	n.s.
Score over 5 (doubtful to pass)	18	54.6	19	57.6	
Total	33	100.0	33	100.0	
<i>Visual Function-Cheiroscope</i>					
Score under 5 (fail)	9	26.5	7	22.5	n.s.
Score 5 or more (doubtful to pass)	25	73.5	24	77.5	
Total	34	100.0	31	100.0	
<i>Color Blindness</i>					
Score 2 and over (defective)	9	36.0	7	25.0	n.s.
Score 1 (normal)	16	64.0	21	75.0	
Total	25	100.0	28	100.0	

## A Research Report on Colour Story Reading

J. Kenneth Jones

While use of color in the various visual media has increased enormously, typography remains essentially black and white. Colour Story Reading was developed to make use of color in helping children learn to read. The theory and practice of Colour Story Reading is discussed, including two studies testing this approach: one showing children's preferences and better performance, and another showing superior reading attainment in black and white after initial reading with color.

In visual media there has recently been a tremendous movement away from black, white, and grey—and into color. This can be seen in photography, films, television, advertising, and book illustrations.

Typography is the tortoise. The largest areas covered by typography remain black and white. Only in the field of display and advertising material has color made any real impact. Yet here the advance is impressive. To glance at a selection of book jackets is to see the extent to which colored print or colored backgrounds have taken over from black and white.

In September, 1967, Thomas Nelson and Sons, London, published Colour Story Reading (Jones, 1967b). This was an event which may be of even more significance to typography than the invasion of color into advertising. For the first time, schools and parents were able to obtain children's reading books in which the entire text is in a phonetic color code. Instead of children learning to read with black print, they learn with colored print. The basic educational idea, of course, is to help children to learn to read in black print. This is done by making the initial learning processes more enjoyable and helpful by adding color to shape.

Colour Story Reading material includes 19 stories which are