Culture and Memory[1]

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The problem of specifying the ways in which culture influences cognitive processes is discussed using the relation between culture and memory as a special case. Beginning with scattered suggestions from the anthropological and psychological literature, a research strategy combining ethnolinguistic and experimental psychological techniques is described. Mnemonic performance is shown to depend upon a host of situational (cultural) factors which must be systematically explored in order to determine culture-memory relations.

THIS PAPER is concerned with a question that has interested Western man ever since the voyages of discovery beginning in the fifteenth century: *Do the bearers of different cultures think differently*?

As interesting and straightforward as the question of cultural differences in cognition may seem, it has proved resistant to scientific inquiry in the general form in which it is usually stated. It is the purpose of this paper to explore the relation between culture and cognition in the hope that we may be able to reformulate this question in ways which suggest empirical and experimental studies and which will have concrete educational implications.

One difficulty with this enterprise is that terms such as thinking, cognition, and culture are defined so variously and often so vaguely that it is very difficult to ascertain whether disagreements are problems of fact, definition or interpretation. For instance, one anthropologist commented, upon hearing about the results of our first research in this area (Gay and Cole 1967):

> The reasoning and thinking processes of different people in different cultures don't differ . . . just their values, beliefs, and ways of classifying differ [personal correspondence].

Implicit in such a statement is a definition of thinking that excludes a great deal of what psychologists have traditionally included under that term. Implicit too is a distinction between *what* people think and *how* they think, the "static" and "dynamic" aspects of cognitive behavior. A great deal of what has come to be termed "cognitive anthropology" (Tyler 1969) has been concerned with the *what*, rather than the *how*.

In our own work, we have found it useful to make this distinction between the *content* of cognitive activity and cognitive *processes*. At the very minimum, everyone would agree that Eskimos and Bushmen often think *about* different things simply because of the radically different environments in which they carry on their daily activities. General agreement can also be easily reached on the proposition that Bushmen and Eskimos "think differently" about some things which they experience in common. For instance, both groups think about their families, but have different thoughts (e.g., different "beliefs" or "values") concerning them. These examples seem to characterize the kind of cultural differences in cognitive activity accepted by our anthropological correspondent.

When one turns to a consideration of *how* people think, agreement is more difficult to

achieve; when the contents of thought are the same, do people operate differently on these contents as the result of training specific to certain cultural settings? At one extreme, it is suggested that there are universal modes of expression, shared by all languages investigated thus far (Greenberg 1963). At the other extreme, each man's approach to problem solving may depend significantly on his personal background and training.

Early interest in these issues was stimulated by the controversial studies of cultural variations in cognitive processes contained in Lévy-Bruhl's treatise on *Primitive Mentality*, in which he drew upon a wealth of informal anthropological and missionary evidence to support his generalization that the thinking of primitive people is governed by different laws than that of their civilized brethren.

Thus we find him reporting:

> These observers (missionaries-authors) have maintained that primitives manifest a decided distaste for reasoning, for what logicians call the "discursive operations of thought"; at the same time they have remarked that this distaste did not arise out of any radical incapability or any inherent defect in their understanding, but was rather to be accounted for by their general methods of thought [Lévy-Bruhl 1966:21].

Without denying primitives' abilities to function ably and skillfully in many situations, Lévy-Bruhl comes to the conclusion that the laws of mental functioning of primitive peoples are fundamentally different from his own.

> Their mentality, essentially mystic and prelogical as it is, proceeds to other objects, and pursues other paths than our minds do . . . To follow primitive mentality in its course, to unravel its theories, we must, as it were do violence to our own mental habits, and adapt ourselves to theirs. [Lévy-Bruhl 1966:442].

Lévy-Bruhl's point of view has been roundly and repeatedly criticized by anthropologists and others (beginning with Boas 1911). The most recent and perhaps the most cogent criticism has appeared in two papers by an English anthropologist, Robin Horton (1967a, 1967b). The gist of Horton's argument is that in terms both of its function and its structure, the examples of primitive thought marshalled by Lévy-Bruhl and others are quite consistent with analogous belief systems of Western man. The anthropologist should not be seduced by the seemingly bizarre beliefs of some primitive peoples into thinking that they do not share his thought processes. Horton suggests rather that the anthropologist study human behavior in well defined and limited situations in order to determine what cognitive processes are at work. General conclusions can be drawn only on the basis of a large number of such studies among widely diverse peoples, studies as free as possible from the tacit assumption of Western superiority.

The number of carefully controlled studies of the relation between culture and thinking is as yet quite small. The various attempts which have been made by anthropologists, linguists, and psychologists to solve the general problem of culture and cognition can at best be suggestive only of hypotheses for research. We thus take Horton's advice to heart and consider the cognitive processes of particular groups of people in particular circumstances. In so doing, we can temporarily avoid the difficulty of having to define such lofty terms as culture and cognition, pointing instead to the set of circumstances and operations that interest us. When we have learned enough to account adequately for some limited sets of data, we might feel freer to attack the general problem, armed with some facts. Nevertheless, even with our limited aims there remain serious methodological problems which limit the inferences that can be drawn from our work. It is our hope that an understanding of the difficulties which we have encountered with problems of limited scope will point the way to con-

ducting more ambitious and firmly based research projects.

The particular problem we wish to discuss is the relation between memory and the specific social and intellectual contexts within which it occurs. For many years, Westerners who have lived in traditional, pre-literate communities have returned with tales of remarkable feats of memory to complement their tales of "lack of discursive thinking." Lévy-Bruhl cites many examples of a presumed ability to memorize, claiming that "In every case in which their memorizing power, which is really excellent, could relieve them of the effort of thinking and reasoning, they did not fail to make use of it" (Lévy-Bruhl 1966:25). Similar general comments are often made by Westerners who teach in Africa; their students do well with material that can be "learned by rote," but are poor or indifferent students when dealing with subjects in which brute memorization will not work.

In addition to this anecdotal evidence, there is good reason to expect members of a pre-literate, traditional society to have developed mnemonic skills different from those of literate, technological societies.

For example, with no written language to mediate recall of every day items, a successful trip to the local market to buy supplies depends on remembering the desired goods. Another example is the emphasis placed on learning the history of the tribe, its traditions, ancestors, taboos, and heroes. History is so much a part of many traditional societies (cf. D'Azevedo 1962; Gay and Cole 1967) that someone who cannot commit large amounts of information to memory is likely to be looked upon as mentally deficient in some way. Thus, D'Azevedo recounts that among the Gola of Liberia "an elder with a poor memory, or 'whose old people told him nothing' is a 'small boy' among the elders and might very well be looked upon with contempt by younger persons" (D'Azevedo 1962:13). Similarly, Elenore Bowen recounts the displeasure and consternation of her Nigerian hosts when she was unable to learn the names of local plants which every six year old in the village had long since committed to memory (Bowen 1964:16).

The generally held belief that mnemonic skills are in some way connected with culture has generated very little research on the question (but see Goody and Watt 1962). Not only have social scientists failed to identify the factors which control the learning of various memory skills, they have as yet failed to document cultural differences in memory at all.

One of the few psychological investigations of memory among African tribal people was carried out by Bartlett and is reported in his famous monograph, *Remembering.* Having heard of the "marvelous word-perfect memory of the Swazi from his childhood up," (1932:248) Bartlett set out to find out when this phenomenal memory manifested itself. First he asked a young boy to carry a message to someone else in the village and found that recall was about on a par with what one would expect of an English child of similar age. Then he tested a cattleherder's memory for a series of transactions involving cattle sold the year before. In this case, Bartlett found that the herder's memory was phenomenally accurate, although he was only peripherally involved in the transaction. Bartlett points out the importance of cattle among the Swazi, and suggests that it is really not so remarkable. The cowherder's feat of memory seems outstanding because what is socially important to him is irrelevant to the Western observer, who therefore finds a good memory for cows and prices unusual. We might expect the Swazi cowherder to be equally astounded should he happen to encounter a Los Angeles ten year old trading baseball cards with a friend with the intricate recall of players, teams, batting averages and relative standing, that the successful trader requires. Unfortunately, the many hypotheses that can be generated from this demonstration have never been followed up and tested.

Our own work in the area of memory grew out of our interest in the factors which impede the education of tribal children in

the Western oriented government schools sprinkled around the interior of Liberia (Gay and Cole 1967). Like other observers, we noted the heavy reliance on what appeared to be serial rote learning in the classroom. Students copied exactly what the teacher did, often failing to grasp the principle involved. Rote learning seemed, however, to be coupled with "rote" teaching. Observations of rote learning in the classroom led us to investigate the tendency of African tribal people to learn by rote under various conditions; perhaps the rote learning was learned in the classroom and not at mother's knee!

To move beyond our rather casual observations required us to choose an experimental tool, or set of tools, which would be appropriate for the study of rote learning. Although the term "rote" as applied to classroom behavior is rather vague, it presumably refers to a person's tendency to repeat material in the same order and manner in which it was presented to him.

This description suggests the serial learning task familiar to the psychologist in which material is presented in a certain fixed order and the subject's task is to recall the material in that order using each response term as the stimulus for the next response (Underwood 1966:457). However, we chose not to begin our research with this experimental procedure because the questions it could answer seemed unnecessarily limited; learning such a task can only be carried out in a serial manner since any deviations from the serial order produce incorrect responses. Instead we chose the method of free recall, which gives both more flexibility and more generality.[2]

The free recall experiment has several features which render it useful for our purposes. First, it is extremely easy to administer. A subject is presented a series of items, one at a time, and is told that he must try to learn them so that he can recall them at a later time. After the last item is presented, a fixed period is given for recall. The list can then be repeated as many times as the experimenter wishes.

Secondly, the subject is free to remember in any manner he chooses; the way in which subjects reorder to-be-learned lists when recalling them in this unconstrained fashion gives important insight into the mechanisms of memory. Bousfield and his associates (Bousfield 1953; Cohen 1963) stimulated interest in this area by demonstrating that when the items to be remembered came from easily identifiable semantic categories, recall tended to be "clustered" so that items from a given semantic category were commonly recalled together. Although there are many questions of fact and theory remaining to be clarified, it is clear from the work of Bousfield and other investigators that North American high school and college students show a strong predilection toward reorganizing material presented for memorization and that success in recall is related to the degree of organization (see the summary article, Tulving 1968).

Given the rather copious experimental literature on organization of free recall as background and the ease of collecting data using the free recall technique we decided to initiate our studies of memory in Liberia with a set of experiments on the factors contributing to the accuracy and organization of free recall.

A few comments need to be made about the experimental context of our studies, although a thorough discussion is beyond the scope of this paper (for more detail see Cole, Gay, Glick, and Sharp 1971).

All of the studies to be reported here were first carried out among the Kpelle tribe in North-Central Liberia. There are approximately 250,000 Kpelle in Liberia, where they are the largest of sixteen major tribes. Approximately the same number live in Guinea, where they are known as the Guerze.

The people live in small towns perhaps ten miles apart of between twenty and 300 huts with between fifty and 1500 inhabitants. Rice is the basic crop; others merely supplement the diet or the family income. Kpelle-land is dense tropical rain forest.

The Kpelle language is related to Mende in Sierra Leone and Malinke in Mali; Kpelle culture shares many features, in particular, a strong secret-society system, with the neighboring West African tribes. There is no traditional form of written Kpelle, but a few Kpelle have learned to read and write their language using a phonetic alphabet.

As a rule, our Kpelle experimentation was done by Kpelle students attending Cuttington College, the base of our operations. Assistants were trained by the authors who were present while many of these data were collected. The experimenter-informants were always consulted as to the proper manner for translating the various instructions from English into Kpelle and were provided with typed versions of the instructions. Experiments were conducted informally in a village house, a local gathering place, or simply on the ground beneath a tree. It was not uncommon for a small crowd to gather nearby to watch the proceedings; participation in the experiments was an amusing diversion for many of the villagers but, where extensive time was required, the subject was "dashed" a can of meat or a quarter. Before beginning a series of experiments in a village, the general purpose of our research was explained to the town chief and the villagers whose cooperation as a group was essential to the success of our work.

The critical first step for this particular set of experiments was the selection of the set of stimulus items which would comprise the to-be-recalled list (hereafter referred to as the input list). Our initial procedure for generating this list was quite simple: we interviewed our experimenter-informants one at a time and asked them what kinds of things were commonly purchased in the local tribal market and small shops. From the set of items generated in this way, we selected a group of twenty items which met the criteria of being known and mentioned by all informants, named by a single generally accepted word in Kpelle, unambiguously identified if shown to a Kpelle person, a member of a familiar nameable category of objects, and easy to present physically. The list of items produced in this manner is presented in Table I. With this list in hand we set out to collect data.

The first data we shall present are from ten Kpelle adults who spoke essentially no English. A subject was chosen and the list of words was read to him at a rate of approximately one word every two seconds. The order of presentation was random with the restriction that no two items from the same category appear next to each other. When the list had been completed, ninety seconds were given for the subject to recall the words while the experimenter noted each response on his answer sheet.

The results in terms of the average number of correct responses per trial and the average degree of clustering per trial are given in Table II.

The data concerning the number of correct responses per trial are easily interpreted and indicate that there is little, if any, improvement in recall with successive learning trials.[3] The clustering scores require

TABLE I. STIMULUS MATERIALS FOR FREE RECALL STUDIES

"Clusterable" List			
Orange	Pot	Hoe	Headtie
Banana	Calabash	File	Singlet
Onion	Cup	Knife	Trousers
Potato	Plate	Cutlass	Hat
Coconut	Pan	Hammer	Shirt

TABLE II. RECALL AND ORGANIZATION: ORAL PRESENTATION

	Trial				
African Adults	1	2	3	4	5
Number Correct	9.1	9.9	10.0	10.0	10.8
Clustering Score	-.53	.04	-.27	.52	.28
College Students					
Number Correct	12.9	15.9	17.5	18.9	18.7
Clustering Score	2.31	3.95	4.16	4.09	4.58

a few words of explanation since our particular scheme for calculating the degree of semantic clustering differs from measures proposed by earlier workers in this field.

Clustering is defined as the tendency of items from a given semantic category to occur next to each other in greater than chance fashion. Using formulas derived from Mood and provided by Wallis and Roberts (1956:569) we were able to calculate a z score which in turn yields the probability of observing the amount of clustering in the output list (see Cole, Frankel, and Sharp 1971 for a discussion of the measurements of clustering). A z score of zero indicates a randomly structured list, a positive z score indicates that there are fewer runs than expected by chance (and hence more clusters).

Returning to an examination of Table II, we see that the Kpelle adults' z scores fluctuate around zero with some suggestion that clustering is increasing slightly over trials.

By way of an initial comparison, data for an analogously constructed list run under the same conditions with a group of American college students are included in the bottom half of Table II. The Americans remember more, cluster more and improve more over trials.

This set of observations brings us face to face with the major problem confronting not only this particular bit of research, but all experimental comparisons of the cognitive activity of different cultural groups. What inferences can be made about underlying cognitive processes from the comparison of performances of groups from the two cultures on a particular task? What kinds of experiments can we design involving these groups which will permit us to draw inferences relevant to specific questions and hypotheses?

Let us examine this question with reference to our little "cross-cultural experiment." From the data in Table II what would we want to conclude? Are Americans better memorizers than tribal Africans? Does the lack of clustering indicate that Africans are indeed rote learners? What about the lack of improvement across trials—does this indicate that Africans are slow learners? On the contrary, *we have only demonstrated differences in the way that adult representatives of two cultures recall a set of common nouns.* This conclusion is neither interesting nor profound. What we really wish to know is the particular variables which control the differential performance of the two groups and the way in which these variables relate to particular cultural differences.

We are by no means the first to recognize the difficulties of such experimental comparisons. The area of greatest concern is this regard has been the research on IQ testing,

where early interest centered on the use of these tests to make inferences about the genetic components of racial differences. For reasons very similar to the criticisms of the crude use of IQ tests within the United States to make inferences about racial differences (Gottesman 1968), the use of IQ tests in Africa and elsewhere has come under heavy attack (Cryns 1962). More recently, Campbell and his associates (Campbell 1961; Segall, Campbell, and Herskovits 1966) and others (Doob 1958, 1968; Jahoda 1968) have considered the general problem of experimental comparisons. Several safeguards against faulty inference have been suggested by these authors. Campbell put the matter well when he says

> We who are interested in using such [cross-cultural] comparisons for delineating process rather than exhaustively describing single instances must accept this rule: *No comparison of a single pair of natural objects is interpretable* . . . However, if there are multiple indicators which vary in their irrelevant attributes, and if these all agree as to the direction of the difference on the theoretically intended aspects, then the number of tenable rival explanations becomes greatly reduced and the confirmation of theory more nearly certain [Campbell 1961:344-345].

As we have pointed out elsewhere (Cole, Gay, and Glick 1968), while accepting the importance of Campbell's suggestions we seek, where possible, to supplement them by an additional consideration; *that wherever possible the inferences about differences between cultures with respect to a given psychological process rest on evidence from the pattern of differences within the cultures being compared.* We will attempt to illustrate the application of this principle in the discussion which follows.

If we take seriously the advice we have been giving in the above paragraphs there is little or nothing that we can infer from the "mini-experiment" summarized in Table II. Clearly we must greatly expand the range of conditions before we can claim to be on solid ground.

The expansions that we decided to undertake were designed to evaluate two main sets of rival hypotheses concerning the relatively poor performance of Kpelle subjects on the first task we gave them. The first set we will consider relates to the materials to be remembered. We generated the experimental list in a relatively informal fashion. Perhaps we put together a "categorizable" list which contained what *we* believed to be reasonable categories, but which were not, in fact, naturally occurring Kpelle categories, or perhaps the subjects categorized the lists subjectively in ways which differed from our assumed classes. If the list were in fact not categorizable from the Kpelle point of view, we would expect little clustering and poorer recall. (Cofer 1968 reviews the evidence showing that clusterable lists are generally easier to learn than non-clusterable lists although there is as yet no generally accepted theory to account for this phenomenon.) Moreover, if the lists were categorizable in different ways, we would also expect not to identify the classes used by the Kpelle, with the basic techniques we employed to measure clustering.

The second set of hypotheses by which we might explain poor Kpelle performance relates to the conditions under which the experiments were performed. On a relatively trivial level, it might be that the subjects are too frightened to respond appropriately, or they fail to take the task seriously, or they need more trials to show the expected improvements or they fail to understand what is expected of them. On a deeper level, it may be that the context of the experiment or the procedures used may radically affect the outcome.

Let us consider first the set of problems dealing with the nature of Kpelle categories and the reality of the categories on our list. Fortunately for us, the problem of discerning indigenous classifications of the environment has been an active area of research among anthropologists in recent years, and techniques have been developed which seek to reduce, if not eliminate, the

bias produced by the ethnographer's own language and culture (cf. Romney and D'Andrade 1964 for a general description of this research and its applications to problems such as those dealt with here). We have borrowed two of these techniques to provide independent checks upon the status of the categories used in the experiment reported above. The first is a relatively structured eliciting technique reported in detail in Metzger and Williams (1963), supplemented by group discussion. We began with the Kpelle word *seng* which roughly has the same meaning as the word "things" in English. Every speaker of English or Kpelle can give many terms which fall within this very general class and can organize these terms into sub-classes.

This work, carried out by John Kellemu, a college graduate and member of the Kpelle tribe by birth, used the substitution frame "____ kaa a ____" which can be roughly translated as "____ see as ____." The first term is a member of the class named by the second. Either term may be replaced by a question word. For example in English we might say "A stone is a thing. What else is a thing? A bird is a thing. A bird is what else? A bird is an animal. Or, the sequence might go, "A bird is an animal. What is an example of a bird? A robin is a bird." There are clearly many ways to use this frame sentence to elicit members of particular classes and classes which include particular objects.

The result of these procedures is a tree diagram which divides the universe of material objects into town things and forest things. These two main classes correspond to the two basic features of Kpelle life, the human village community and the non-human surrounding rainforest. Each of these main classes is in turn divided into sub-classes determined by their relation to human life (see Table III).

This classification of material objects (*seng*) is clearly not the one familiar to a person brought up in the American culture. A comparable American chart might divide things at the highest level into animate and inanimate, with living things divided into animals and plants as the next lower division of the whole tree diagram.

Comparing the categories on the *seng* chart with the recall list, we found reflected in the chart what we took to be categories on the basis of our informal elicitations. We learned in addition that three of the categories were unambiguously located within the more general class of household goods, while the fourth, foods, is doubly classified; it is a type of work under the heading of town things, and a major category under forest things. Although a systematic study of the relation between the horizontal and vertical distance among classes on the *seng* chart as it relates to memory would be a worthwhile project (parts of which we have undertaken, but do not intend to discuss here see Cole et al. 1971), the evidence generally supports the acceptability of our categorized list.

However, we were not entirely happy with this procedure. For one thing, we suspected that the eliciting procedure might have influenced the kinds of categorization we observed. For instance, Kpelle people will also separate *seng* into "good things" and "bad things" and indeed this sort of response makes good sense to us. But in the case that the elicitor expects some other response, it may be more detailed questioning will cause the typical informant to switch to the "town-forest" dichotomy. How general, then, are the situations in which the *seng* chart categories are appropriate and rapidly elicited?

To obtain some information on this point, we gathered data on items from the *seng* chart using an eliciting technique which is considerably less structured than that used by Kellemu. For this purpose, we applied a technique used extensively by Stefflre in studies of similarity structures (Stefflre 1969). This eliciting technique is tedious, but extremely simple and non-directive. We will illustrate the procedure using the twenty items from our clusterable list augmented by sixteen items chosen in a manner similar to

TABLE III. SENG CHART

Things												
Town Things						Forest Things						
Persons	Structures	Household	Work	Town Animals	Play	Food	Traps	Trees	Shrubs	Vines	Evil Things	Earth
Children	House	Sleeping Things	Household Goods	Birds	Dancers	Yams	NUMEROUS	Secondary Bush	Wild Shrubs	Wild Vines	Male Society Leader	Dirt
Important Persons	Shed	Tools	Medicine	Walking Animals	Dancing Equipment	Vine Fruits		High Forest	Cultivated Shurbs	Cultivated Vines	Female Society Leader	Stones
Fine Persons	Fence	Cooking Utensils	Vehicles		Games	Tree Fruits		Cultivated Trees			Frightening Things	Sand
Workmen	Bench	Clothes	Food		Drums	Liquids					Witches	Mud
Evil Persons	Loom		Traps		Horns	Mushrooms					Genie	
Ways of Working	Society Fence					Animals					Dwarfs	
Ways of Being	Chief's Fence										Spirits	

the original list except that they were intended to be randomly selected with respect to semantic categories. These thirty-six words were read one at a time to the informant whose task was to make up an acceptable sentence using that word. When a sentence was produced in this way for each word, the subject was read each of the sentences with each of the total list of thirty-six words inserted in the place of the original word. The subject was asked to judge for each new sentence if "a Kpelle person would say this." For instance, the subject might use the word "cup" in the sentence "I took the cup off the table." He would then be asked whether or not it made sense for a person to say, "I took the ____ off the table " where ____ was each of the remaining words of the list. If the substituted word was acceptable in a given sentence, a "1" was inserted in the proper position for that word and sentence in a 36 x 36 matrix. This procedure was carried out with fourteen Kpelle adults, and the fourteen matrices summed to form a matrix whose elements ranged from 0 to ten. This matrix was then processed using a program provided by Stefflre which rearranges the rows and columns in such a manner that words whose distributions of elements in the resultant matrix were most similar were closest to each other. This procedure produces a new list of words which are "clumped" together in terms of the similarity of their distributional characteristics. The results of this analysis are included in Table IV as the "Rearranged list," and show clearly that the clusterable items in fact separate themselves from the non-clusterable items. In addition, two of the non-clusterable items fall within or next to a category cluster to which they seem to belong; thus, "bottle" falls within the cluster that we have identified as utensils and "nail" come next to the category of tools.

The convergence in results for these three widely different ways of arriving at a set of commonly categorized items leads us to be fairly confident that for some contexts at least, the items we used on our memory experiment really are categorized by the Kpelle in the way we originally assumed them to be. Since the eliciting situation is formally quite similar to the free-recall experimental situation we feel moderately safe in assuming that the lack of categorizing observed in our memory data is not the result of using inappropriate materials or of expecting them to be organized in inappropriate ways.

TABLE IV. REARRANGED LIST

Calabash	Potato
Bottle	Onion
Pot	Banana
Pan	Orange
Cup	Coconut
Plate	Cigarette
Box	Nail
Horn	File
Book	Hammer
Trousers	Hoe
Singlet	Knife
Shirt	Cutlass
Headtie	Mat
Hat	Candle
Cotton	Stone
Rope	Battery
Stick	Feather
Grass	Nickel

Having thus assured ourselves of the material and linguistic foundation for our Kpelle studies, which is all too often taken for granted in United States-based research, we felt free to turn again to the experimental question before us with some assurance that it is in fact a proper question.

Our experimental attack focused on the types of persons, verbal instructions, and

material conditions which could reasonably be expected to affect the rate of learning and degree of clustering in the free recall experiment. The first variation involved the nature of the stimulus materials. One point upon which many observers of African learning seem to agree is the presumed "concreteness" of African thought. For instance, Cryns (1962), who has no use for IQ tests as ordinarily applied, maintained that the "empirical evidence suggesting the prevalence of a concrete way of thinking in the African . . . is too substantial to be refuted." Perhaps, then, if we showed the objects named by each of our stimulus words to our subjects, instead of reading them aloud, we would observe greatly augmented recall and clustering. Several studies with Americans have shown increased recall using pictures rather than verbal stimuli (e.g., Scott 1967). Thus, if African mentality is more "concrete" than that of Americans, we should expect not only augmentation, but proportionally greater augmentation than ordinarily observed with Americans.

A second variation involves the clusterability of the lists themselves. As mentioned earlier, American evidence (Cofer 1968) indicates that clusterable lists are easier to learn, in general, than lists chosen so that their members belong to disparate classes. If the Kpelle rely on rote memory rather than the clusterability of the list, then they ought to recall equally well on both lists. We used the list given in Table V as our non-clusterable list. These terms were elicited informally with checks only on their general unrelatedness. When the non-clusterable list is used, of course, no clustering score can be computed.

Another variable which has been found to affect clustering and recall is the arrangement of items in a clusterable list. If the items are *not* randomly arranged as in our original experiment, but rather are presented in a clustered fashion, clustering and recall are enhanced for American college students (Cofer, Bruce, and Reicher 1966).

We chose subjects of different ages and educational levels because we guessed these variables might influence clustering and recall. The three age groups represented are six to eight years, ten to fourteen years and eighteen to fifty years. For the first two age groups educational levels were unschooled, first grade and second to fourth grade. Since it is very rare to find an educated tribal adult, we did not include an educated adult group in our early experiments. At a later stage, we added comparisons which included high schoolers who ranged in age from fifteen to twenty. In general, Kpelle children do not know their ages. Moreover, grade in school very often does not correspond to years in school, since a student is likely to remain in the beginner's half of the first grade until his English comprehension is adequate to continue. These factors should make us generally cautious about overstating the accuracy with which we can relate performance to age and schooling, a fact which complicates our already complicated task of cross-cultural comparison. We ought also to point out that factors such as status and degree of Westernization are likely to

TABLE V. "NON-CLUSTERABLE" LIST

Rope	Grass	Nickel	Orange
Cotton	Horn	Bottle	Pot
Book	Battery	Feather	Knife
Candle	Mat	Nail	Shirt
Stone	Cigarette	Stick	Box

co-vary with age and education, leading to further restrictions on any conclusions we might want to draw from the data.

In order to make cross-cultural comparisons we have collected data from children in Southern California who are primarily white, from middle-class homes. Although this population is clearly not optional (a wide range of socio-economic and ethnic backgrounds should be investigated), it was used because of its availability.

The first two variables we consider are education and the clusterability of the lists. This experiment included four groups of Kpelle children ages ten to fourteen, two groups being educated and two illiterate, with ten children in each group. One group at each educational level was presented the clusterable list in Table I, and the other the non-clusterable list in Table V. All other conditions were identical to those described in our initial example; in particular, presentation of the lists was oral. Results of this experiment, as well as results from American groups, are presented in Table VI.

Looking first at the African data, we see that the clusterable list was more easily learned than the non-clusterable list and the school children were superior to their non-literate counterparts.[3] None of the groups recalled particularly well and although the improvement across trials was reliable, it was very small in magnitude (about 1.7 items).

No group showed a significant degree of clustering on any trial. The data from the educated and non-literate groups were homo-

TABLE VI. FREE RECALL RESULTS: EXPERIMENT 1

		Trial				
AFRICAN		1	2	3	4	5
Recalled	Clusterable	7.6	8.6	9.0	9.2	9.6
	Non-Clusterable	6.6	6.8	6.6	7.8	8.2
	Educated	8.0	9.0	9.0	9.4	9.8
	Illiterate	6.2	7.2	7.6	7.7	8.0
Clustering		-.17	-.14	-.23	-.03	-.08
Position Correlation		-.05	+.04	+.02	.00	-.09
AMERICAN						
Recall	1st Grade	4.8	6.8	6.8	8.0	8.4
	4th Grade	7.4	9.2	9.8	10.8	11.2
	6th Grade	8.6	11.0	11.6	12.8	13.4
	9th Grade	8.8	11.6	13.1	14.6	14.9
	Clusterable	7.6	10.8	11.8	12.2	12.4
	Non-Clusterable	7.0	9.1	9.9	10.9	11.6
Clustering	1st Grade	-.69	-.36	.15	.34	.75
	4th Grade	-.35	.48	.16	.43	1.32
	6th Grade	.49	1.17	.89	1.71	1.40
	9th Grade	.46	.83	1.30	2.04	1.98
Position Correlation		+.22	-.17	-.31	-.25	-.20

geneous in this regard, and are thus not reported separately.

For the American school children, too, clusterability of the list produced improved recall although in both relative and absolute terms, the enhancement was *less* than that found among the Kpelle. The *pattern* of American results reported is quite different than the *pattern* for the Kpelle, even where average scores are quite similar. The American children show considerable increases in the recall and clustering scores from the first to the last trial and all American groups exhibit significant clustering by trial 5.

At this point we want to introduce two additional measures of performance indicative of the qualitatively different ways in which items are being recalled in the two cultural settings.

First, let us consider the possibility that the lack of clustering among the Kpelle occurred because they were attempting to learn by rote, i.e., remember the items in the order in which they were presented.

As one measure of "rote learning," we calculated the correlation between word order on the input list and the word order of each subject's output list. A high correlation is indicative of a close correspondence between input and output orders.

It is apparent from a brief consideration of the "Position correlation" measure in Table VI that the Kpelle subjects are *not* "rote learning," while the American subjects show a good deal of rote learning on the first trial, but not thereafter.

A second difference in the *way* items are being recalled, and one which helps to explain the negative position correlations observed among the American subjects is apparent in an examination of the performance of the two populations as a function of the serial position of the items.

The American subjects manifest a typical serial position curve (Deese 1957); items very late in the list are best recalled, then items at the beginning and finally the middle items. By contrast the African data are relatively flat with respect to serial position (Figure 1).

How should we interpret the outcome of this expanded experiment? We have observed some clear differences in the Kpelle subjects' performance as a function of education and the organization of the stimulus materials. However, these differences were generally small in magnitude; accuracy levels characteristic of American subjects were not reached. Moreover, the pattern of results indicates that the African subjects approach the memory task in a different way from their American counterparts. However, this difference cannot easily be attributed to rote memorizing, the traditional hypothesis concerning the nature of such differences, since there is no evidence in our data to confirm this hypothesis.

A second experiment in this series looked once again at the effect of education. This time, however, the clusterable list was used for all groups, half being school children aged ten to fourteen, and the other half nonliterate ten to fourteen year olds. These two populations were sub-divided so that half of each group were shown objects to recall, while the other half followed the procedure of the previous experiment in having the words read to them. Each of these subgroups was again divided so that half the subjects were shown the objects (told the words) in the random order used in the initial experiment, while items for the remaining subjects were "blocked" so that all items from a given category occurred together. Thus, education, stimulus materials, and list order were all factors in this experiment.

In this case, education did *not* have an overall effect. The mean number of words per trial recalled by all educated subjects was about the same as that of the uneducated subjects. However, education interacted in an interesting way with the nature of the stimulus materials. Educated subjects performed much better when objects were presented than when words were used (10.8

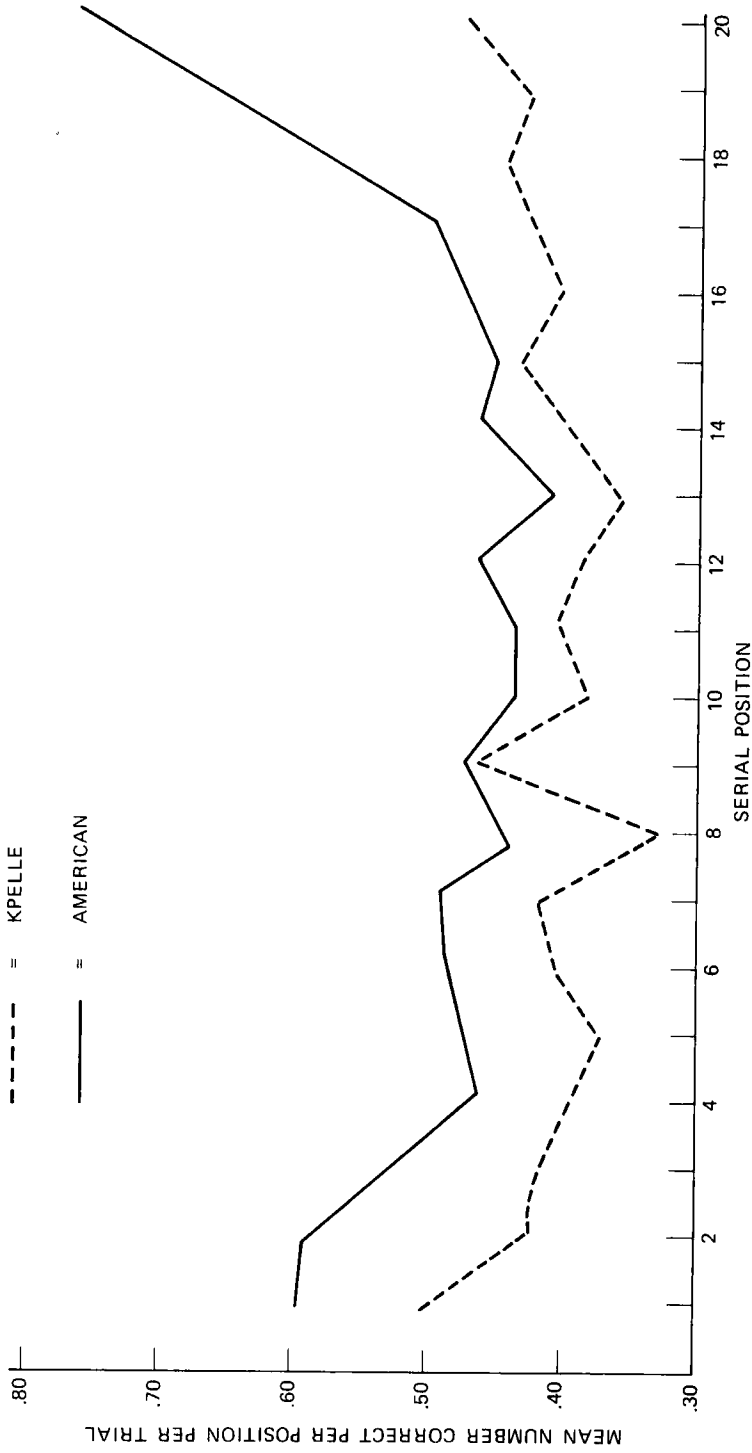
KPELLE
AMERICAN
MEAN NUMBER CORRECT PER POSITION PER TRIAL
.80
.70
.60
.50
.40
.30
2
4
6
8
10
12
14
16
18
20
SERIAL POSITION

Figure 1.

vs. 9.1), whereas uneducated subjects performed equally well for both modes of presentation (9.6 vs. 9.6). This finding points up the extreme caution that we must use when the magnitude of our effects is small; remember that in the previous experiment a small but consistent advantage accrued to the educated subjects. This same superiority did not occur in the present experiment under the original conditions, but only when objects are used. It is the partially Westernized Kpelle child who benefits from concrete stimuli, not his traditional and non-literate brother. Moreover, the American child benefits still more than the Kpelle school child from use of objects.

The blocked order of presentation also facilitated recall slightly for the Kpelle, but did not differentiate between non-literate and educated subjects. Americans likewise showed only slight improvement in recall as a result of blocking.

The degree of clustering observed in the present experiment was consistent with that in the previous experiment in that presentation of words in a random order resulted in total lack of clustering (.07). However, when the words were presented in a blocked fashion, significant clustering appeared (1.2). Use of objects rather than words enhanced clustering for both the random (.23) and blocked (1.92) methods of presentation. In cases where there is a high clustering score, the organizational hierarchy of terms which emerges when pairs of terms are considered is exactly that of the presumed classes and is quite pronounced, in contrast to the hierarchy derived from the original experiment and reported above.

The same pattern of results was obtained with American school children. Blocking the materials according to classes increased clustering greatly. Presenting objects increased clustering by a wide margin, just as it had increased recall.

In terms of the average magnitude of the effects, the Kpelle children performed very much like American first graders who were 4.8 years younger on the average. However, the pattern of responding was once again not the same. The American children exhibited a strong serial position effect, while the Africans displayed roughly the same accuracy at all serial positions. And again it was the *American* subjects who showed an initial tendency to order their recall according to the order of the to-be-remembered list. The correlations between input and output for the African subjects were always near zero.

What can we conclude on the basis of the experiments reported thus far? We seem to have established that although the Kpelle and American subjects are effected in a similar manner by some standard experimental manipulations, the Kpelle performance remains inferior in quantity recalled, and the *pattern* of responding under different circumstances is quite different. In particular, the Americans seem to take much greater advantage of such presumed aids to learning as organization according to semantic category, physical presence, and privileged position in listing the materials. The assumption that such factors aid learning may in itself be culture-bound. Our experimental manipulations were chosen because they are familiar to Americans, not because of known relevance to the Kpelle.

We therefore must consider possible hypotheses to explain Kpelle performance, both in terms of recall and clustering levels, and in terms of pattern and response. Might there be reasons why our presumed American aids to learning are ineffective, and might there be procedures which the Kpelle find helpful?

A simple alternative is that our African subjects simply don't care—they aren't taking the task seriously. To test this notion we used the same basic subject populations in an experiment designed to give the subject good reason to want to perform well. In addition to being asked to remember as much of the list as possible, each subject was told that he would be given a stone for each correctly recalled word and that the stones could be traded for money at the end of the experiment.

The result of this experiment is easily

summarized. Recall averaged 10.1 items when all of the groups were summed (schooled and non-schooled six to eight and ten to fourteen year olds plus a group of non-literate adults). There were no differences among groups and no changes over trials. Clustering followed the same pattern; it began and ended at a chance level among all groups. These results are different in no significant way from those obtained in the initial experiment.

Similarly, we found that extending the number of trials, promising more money, and using more "traditional" items failed to influence the major pattern of the results.

At this point, we shifted our attention to a consideration of the cues that our subjects were using at the time of recall. We began with a vague notion that the performance of the Kpelle subjects would be improved if the *categories* latent in our clusterable list were somehow signalled by an object in the real world. Thus we arranged a situation in which the objects shown to our subjects were associated with chairs. Perhaps the "concreteness" is not in the to-be-learned material, but in the relation of this material to recall cues.

The experimenter stood behind four chairs, in front of which stood the subject. Behind the experimenter was a table containing the objects to be remembered. These objects were held up one at a time over chairs as the list of items was presented and then the subject was asked to recall the items (but not which chair they were associated with).

The presentation of items followed a different pattern for each of three different groups of ten to fourteen year old school children. For one group items from a given category were held over one particular chair on each trial, so that each category was assigned one chair. For the second group, items were assigned at random to the four chairs, with the assignment remaining the same for each trial. For the third group there was only one chair over which the items were held, while the other three chairs were not used.

This variation in procedure produced much greater recall for all three groups than we had previously observed. The average number of items recalled per trial was 14.2, 14.6, and 15.1 for the three groups respectively (this difference was not statistically significant). However, the clustering scores for the three groups varied widely. The group for whom chairs corresponded to categories produced an average clustering score of 2.27, the group having only one chair had a score of −.27, and the group having items assigned at random to chairs had a score of −.59. This latter group significantly avoided clustering according to the semantic categories, indicating that they might be grouping by chairs (an hypothesis not yet evaluated).

It appears that we have produced greatly augmented recall by our "concrete cuing" procedure. Under the proper circumstances we also produced augmented categorical organization. However, organization according to categories is *not* a necessary condition for improved recall. The chairs in groups two and three are not related to the semantic categories, but nonetheless appear to augment recall. If they do so by augmenting organization, the means of organization remain obscure.

We are presently extending this cuing notion to other populations and other forms of cuing. Particularly important from a pedagogical point of view is the question of whether we can find a means of *verbal* cuing which can augment recall. Can we teach our subjects to remember better using mechanisms less unwieldy than chairs?

An initial attempt to use verbal cues involved a variation on a technique used by Tulving and Pearlstone (1966). Subjects were read the standard clusterable list and recall was measured under five conditions. For the groups cued when the list was introduced on each trial, the experimenter said "I am going to tell you about several things. *These things will be clothing, tools, food, and utensils.* When I tell you these things, listen carefully." The list was then presented in the standard, oral fashion. For

groups cued at the time of recall, the list of categories was repeated. If no cuing occurred, the italicized sentence was omitted. The possibilities of cuing or not cuing, prior to presentation (input) or prior to recall (output) resulted in four experimental conditions. In addition, a group of subjects was run for four trials with no cuing at input, but highly constrained cuing at the time of recall. After the list of items was presented to subjects in this group, they were asked to recall the items category by category. For instance, the experimenter would say, "Tell me all the clothing you remember." After the subject had named all the clothing items he could remember, the experimenter would repeat the procedure with each of the other categories. On the fifth trial no cuing was given at all, and these subjects were told simply to remember as many of the items as they could.

Comparison of the first four groups indicated that our unconstrained cuing manipulations had little effect on recall or clustering. There were no significant differences between groups on either measure and performance measures were comparable to those obtained in the standard, oral presentation situation.

The results from the fifth group were quite different from those of the four unconstrained groups. Recall for the first four trials was extremely high, averaging approximately seventeen items per trial. Moreover, recall remained high on trial 5, when 15.2 items were recalled. Clustering was forced to be perfect for the first four trials with this group, but on trial 5 clustering remained high, 2.23, a score comparable to that achieved with the chairs, and comparable to the performance of American schoolchildren. It appears that good performance at memory and organization can be induced through sufficiently explicit verbal instruction and training.

This entire experiment was repeated with American school children in the third and sixth grades, and essentially the same results were obtained as with the Kpelle. The first four cuing procedures, at input and output, did not augment clustering or recall. Only when subjects were constrained to recall by category was performance improved, and improved substantially.

Finally, we sought to evaluate recall of our basic terms in a situation as similar as possible to situations in which the Kpelle are likely to be good at remembering things. For this purpose we chose memory for stories, but not just any stories. Instead we constructed several pseudo-Kpelle folkstories built around our twenty clusterable memory terms. The question at issue was whether recall of these terms would reflect the way in which they were embedded in the story.

For example, in one story a young man comes to the chief of a town and asks to marry the chief's daughter. He brings good bridewealth and the chief gives his daughter to the man. However, she soon learns that he is a witch and she wants to let her parents know where the man has taken her. So she leaves clues along the path as she travels to the witchman's farm. As she is going out of the door of her house she drops a banana. At the edge of town she drops a kerchief. As they are crossing the bridge over the river she drops a spoon, and so on. The subject is asked to tell what clues the girl left behind.

A second story involves four men who come to town to ask for the chief's daughter. The first man brings five items of clothing, the second brings five items of food, and third brings five utensils, and the fourth brings five tools. Once the story is told the subject is asked which man ought to get the girl and secondly to tell which things each man brought.

In analyzing the results we found that the structure of the subject's recall was isomorphic to the way in which the to-be-recalled items were structured within the story. If the terms were structured in a linear manner, a high correlation between input and output orders was observed. However, if presentation structure was clustered, so was the structure of recall.

A complete answer to the question of how cultural factors influence memory is clearly not contained in our work, nor do we believe it possible to obtain a complete answer. We can affirm only that we have reached a much better understanding of the situation than that represented by our initial, naive, two-group comparison. In particular, we have seen that good performance at clustering and recall is not simply a function of the materials to be remembered and the persons doing the remembering. Each of our experimental procedures combines an occasion for the exercise of memory as well as with a set of cues facilitating memory. On certain occasions, and with certain cues, the Kpelle are able to recall and organize the material in a way comparable to that which American subjects display on different occasions and with other cues.[4]

The problems that remain are numerous. We have entered upon the study of some of them already, while others are on the agenda for future work. We must find other places within the culture where the cues and occasions we identified help to facilitate cognition. In particular, use of chairs to improve recall, even when clustering itself was at the chance level, may well have spatial organization counterparts in other areas of Kpelle thought.

In the future, our work must be still more closely allied with an analysis of Kpelle (and other) culture which is sufficiently detailed to provide us specific links between cultural patterns and learning. This is the goal we seek, an experimental "ethnology of learning," and it is little closer to our grasp now than when we began.

NOTES

[1] An earlier version of this paper was delivered at the American Educational Research Association Meetings in Los Angeles, California, February 6, 1969. The authors wish to thank Fredrick Frankel, John Kellemu, David Lancy, Richard MacFarland, Paul Mulbah, Paul Ricks, and Donald Sharp for their assistance in collecting and analyzing these data. The comments of Robert Calfee, Joseph Glick, William Kessen, George Mandler, and others on the earlier draft of this manuscript are gratefully acknowledged. This research was supported by grant number GS 1221 from the National Science Foundation.

[2] Several readers of an earlier version of this paper objected to our model for rote learning. It should be clear that we are using only one of many tasks in which rote learning could be manifested. It should also be clear that we do not use the term "rote" to mean unorganized, since seriation can clearly be an organizational principle.

[3] The within-culture comparative statements which follow are based on conclusions from analyses of variance of the data. If a difference is said to exist, statistical evidence placed the reliability of the difference at the .01 level. No formal analyses were made comparing Kpelle American data.

[4] For a fuller account of these studies and suggestions for characterizing the nature of the occasions eliciting full recall see Cole et al. 1971.

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