EFFECTS OF SUMMARIES, MARGINAL NOTES AND FLOW DIAGRAMS ON RECALL OF PROSE TEXT.

By

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D E D I C A T I O N

Dedicated to Laraba, Khamai, Ahu and Nbuwat'ayan.

A C K N O W L E D G E M E N T

The writer wishes to sincerely express his gratitude and appreciation to the people who helped him in one way or the other towards the successful completion of this study. In this regard I am greatly indebted to Dr. Mukherjee, Department of Education Ahmadu Bello University Zaria, who continuously supervised the study for his constructive criticisms, important suggestions and constant cooperation. He also helped me analyse the data. I am indeed very thankful for the great help he rendered me in this study.

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A B S T R A C T

The study investigated the position and type effects of different summaries on the retention of some meaningful prose materials. The purpose was to find out if there were any significant differences when the materials are presented with different types of summaries in different positions for different comparable groups of secondary school children.

The retention test consisted of 20 items; which were arranged in such a way that they did not aid students[1] sequential recalling of the materials.

The following hypothesis was tested: There will be no significant differences among the mean retention scores of different comparable groups presented with the prose text materials with different forms of summaries in different positions, for example, marginal notes for every paragraph or for two paragraphs, summary for every paragraph placed either before or after each paragraph and summaries in the form of flow diagrams of algorithmic charts for the entire text placed either before or after the entire text.

Seven random groups of 40 children each were tested. It was established that:

(a) The groups differed significantly from one another in their mean retention scores at the 0.0001 level of significance.

(b) The performances of the groups of subjects receiving 'summaries were better when the summaries were presented after the paragraph or the entire text.

(c) Summaries in the form of flow diagrams were the best means of aiding retention.

(d) The performances of the control group subjects receiving no summaries at all were the poorest of all,

The report ends with some discussion on the psychology of retention and memory from the issues highlighted in this study

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CHAPTER I

INTRODUCTION

One of the perpetual problems of the teachers in the classroom is directly concerned with the ease with which children forget their learning so quickly thereby resulting in underachievement. One wonders why we forget so easily the things we experience or learn in the classroom. What will be the best method in teaching which will help the children to learn in such a way so that the learned or experienced materials are retained for future recall? These are some of the issues which need close examination from the point of view of educational psychology.

Whenever a descriptive passage is read or learned it has to be remembered for future recall in examination and one of the methods in remembering large passages is to make summaries of the passages after learning or during learning. These summaries usually have all the essential points of the main passage and if after learning the main passage the summaries are learned as well, these summaries act as nuclei to help the examinee not only to recall the essential points of the main passage but also the minor points connected with the essential points of the main passage. For example, if a child learns that the canary is yellow or the robin has a red breast from a passage where the child is told that both canary and robin are brids which fly, which sing, which have feathers, which are animals, etc, then recalling that canary is yellow and robin has red

breast will help the child in retrieving all the other minor points of the main passage. That is how the learning of effective summary after learning of the main passage will help the learners in future recall.

But summaries can be of many forms such as marginal notes for every paragraph, marginal notes for every two paragraphs, summary for every paragraph and summaries in the form of flow diagrams of algorithmic charts, etc. What will be the effects of these different forms of summaries on future recall of the learned materials? This is an area in which this present study will be directed. Further, what are the position effects of the above forms of summaries on future recall? Will the effects be the same for a particular type of summary before the text or after the text? This should be another area in which this present study will be directed.

The objective of the study is therefore to examine the effects on recall of a previously learned prose passage by school children when these passages are presented with the different forms of summaries in different positions.

The next chapter deals with the relevant background literature.

CHAPTER II

BACKGROUND LITERATURE

2.A INFORMATION PROCESSING

A human being presented with some new fact is often able to reproduce the fact some period of time later. During that period of time, the fact, or some representation of it, must have been stored somewhere within the individual. It can be safely stated then that human beings possess memory.

What is memory? Implicitly, memory has been defined above as some kind of repository in which facts or information may be retained over some period of time. If this simple definition is accepted, however, memory is possessed not only by human beings but by a great number of other things as well.

It is however believed that the memory possessed by a human being is somehow more sophisticated than the memory possessed by other things having very little or no thought at all. In fact, a human being has not only a memory but an elaborate memory system.

Each individual has an intuitive view of what information is. For example, a person acquired information when he read about the world's longest moustache. However, suppose he is told that the world's southermost continent is Antarctica. It is evident that he has been

told something but he has not acquired any information because he has been told something he already knows.

Shannon and Weaver (1949) took this intuitive notion of information and quantified it; that is, they showed how information could be made measurable. To quantify information, the first thing needed was a unit of measurement. To measure volume, for instance, we have cubic centimeters. But to measure information, we have bits. A bit is defined as: the amount of information that distinguishes between two equally likely alternatives. Assume one has just flipped a coin. If the outcome of the flip was tails, he has conveyed to himself 1 bit of information, since prior to his seeing the outcome there were, as far as he was concerned, two equally likely outcomes to the flip.

It is not important to know exactly how to quantify information. What is important is the idea that the information contained in various stimuli can be quantified and one can therefore see that some stimuli (for example, letters) contain more information than other stimuli (for example, digits).

Suppose a person flips a coin and the outcome is tails. It has been seen that the outcome represents 1 bit of information. However, this 1 bit may take on a variety of physical representations. The coin itself lying on his wrist is one physical

representation. If he says "tails", that is another representation of the same information. Changing the form of the same information from one representation to another is called recoding.

An important tool for any scientific theory is a model or physical analog of that about which one is attempting to theorize. For the atomic theory of Niels Bohr, the model is a tiny solar system with planets (electrons) spinning in their orbits about the sun (nucleus). For stimulus-response psychologists, the model is a telephone switchboard with calls coming in from the environment (stimuli) being routed via switchboard connections to the appropriate telephone (responses). For psychologists working within an information processing framework, a computer provides an apt analogy of what is happening inside a person's head. Both computers and people are information - processing systems, and Table 2.1 shows a schematic view of the analogy.

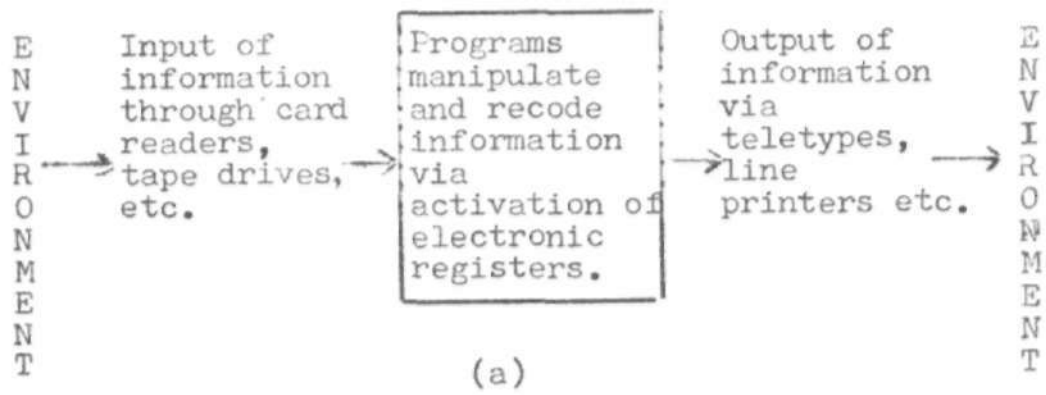


FIGURE 2.1: SIMILARITY OF INFORMATION PROCESSING IN COMPUTERS AND IN HUMAN BEINGS.

(a) COMPUTERS

(b) PEOPLE.

The above figure shows that both the computers and human beings take in information from the environment. Computers do this using card readers, tape drives, etc., whereas human beings do it using their sense organs. Inside a computer, the information from the environment is manipulated, recoded, and combined with other information already there. This is done via activation of electronic registers. Inside a person, information is manipulated, recoded, and combined with other information already there. This is done via

activation of neurons. Finally, a computer outputs information to the environment via output devices, such as teletypes and line printers. Likewise, human beings output information to the environment via such output devices as mouths and hands.

To extend the analogy, a distinction can be made at this point between computer hardware and computer software. Computer hardware is that which is built into the computer at the time it is made - the nuts and bolts, the metal frame, the transistors, resistors, and circuitry. Analogously the "hardware" of a person consists of a body, of bones, of a complex system of neural circuitry, and so on. In contrast, computer software consists of programs, which cause the computer to manipulate information in various ways. A program is simply a series of instructions, written in a language the computer is built to understand, that tells the computer precisely what to do with the information presented to it. Programs are not built into the computer; instead they must be put in or "learned" by the computer.

Human beings can also be thought of as possessing programs. For example, the capability of being able to add the numbers 321 + 714 was not built into an individual at birth. At some point, he had to learn how to add; that is, a program designed to carry out addition had to be put into him.

Using a computer analogy, therefore, human behavior is viewed as resulting from an interaction between information acquired from the environment and programs residing within the human being that process and utilize this information.

A model of memory has been advanced in one form or another by a number of psychologists, for example, Waugh and Norman (1965), Glenzer (1972), and was described in its most complete form by Richard Atkinson and Richard Shiffrin (Atkinson and Shiffrin, 1968, 1971). Atkinson and Shiffrin formulated the theory as a mathematical model; this meant that the theory's assumptions took the form of mathematical equations and that it made specific, quantitative predictions about the outcomes of various experiments. Figure 2.2 represents a schematic and somewhat oversimplified view of the memory and information - processing system according to this theory.

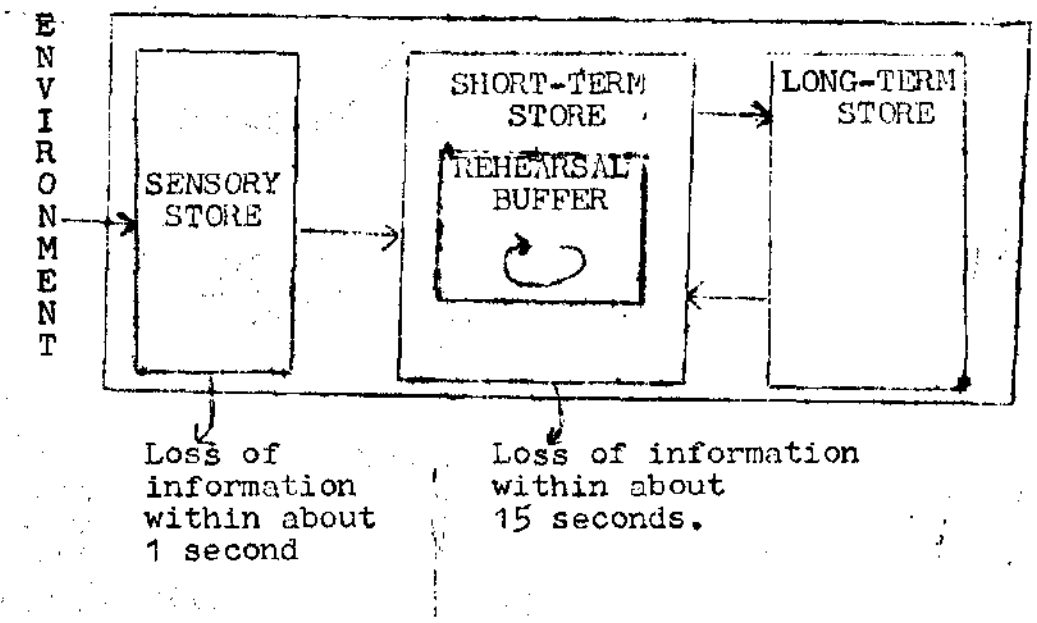


FIGURE 2.2: A SCHEMATIC VIEW OF THE TWO-STORE MEMORY SYSTEM.

The boxes in the above figure represent "stores" or repositories of information; the arrows represent the flow of information from place to place. Imagine that a person looks up a telephone number, such as 325-5064. The information first enters the system through one of his sense organs. In this case, the number is presented to him visually, so it enters through his eyes. The first store into which the information is placed is called sensory store. Sensory store can hold a large amount of information; in fact, it holds virtually all the information impinging on a particular sense organ. However, information in sensory store decays away very quickly - in most cases, within a second or so. Therefore, unless information in sensory store is quickly transferred somewhere else, it will be lost.

Some of the information in the sensory store is indeed transferred into the next store, which is called short-term store. Short-term store, which may be introspectively equated with consciousness has several major characteristics. First of all, it is of a limited capacity; it is large enough to hold one telephone number but probably not large enough to hold two. Second, information in short-term store is, in general, lost within about 15 seconds; we have all had the experience of looking up a telephone number and walking across the room to dial it, only to discover that the number has been lost by the time we reached the telephone. However, information in short-term store may be placed into a special section of short-term store called a rehearsal buffer. Information in the rehearsal buffer does not decay away but may be maintained indefinitely via the process of rehearsal. Rehearsal means that information is repeated over and over. So if a person entered the number 325-5064 into his rehearsal buffer, he can maintain it by repeating to himself "325-5064, 325-5064....." for as long as he wishes.

Which information gets entered into the rehearsal buffer? The theory assumes that people have the ability to enter whichever information they wish into the rehearsal buffer, allowing other information to decay away from short-term store.

The final component of the system is long-term store. Long-term store is the virtually unlimited capacity store of that information which a person has more or less permanently available to him. For example, our own names, the days of the week, and so on are all stored in long-term store. The longer some particular information resides in short-term store, the more likelihood of that information being transferred into long-term store. If an individual sits around repeating "325-5064" over and over to himself, he is maintaining it in short-term store. Additionally, during this time, information about the number may be transferred to long-term store. In other words, he memorized the number.

Suppose a person is called on to retrieve some information that has previously been presented to him. He first checks to seek whether that information is in short-term store. If it is in short-term store, that's fine; he simply retrieves the information and use it. If the information is not in short-term store, he doesn't despair yet, for the information may have resided in short-term store long enough for it to be completely transferred to long-term store. Therefore, if the information is not in short-term store, he next searches long-term store, and if tne information is there it can be retrieved and used. (Retrieval and utilizatio.

of information from long-term store essentially consists of transferring information from long-term store to short-term store. This is represented by the arrow pointing left in Figure 2.2). It is possible of course, that some but not all of the information has been transferred to long-term store. Thus, he may remember the exchange, 325, but not the rest. He may remember 325-506-, and remember that the last digit was even. He might have transferred the information corresponding to the digits themselves but not the information about their order, in which case he may retrieve the number 325-5604 and dial a wrong number. This is a very brief sketch of how the memory system is assumed to operate. The type of memory system that has been described is often referred to as a two-store system in reference to its two major information stores, short-term store and long-term store.

Information impinging on the senses initially goes into what is called sensory store. The term "sensory store" is actually a misnomer because there are several different sensory stores, one corresponding to each sensory modality. Visual information entering the eyes is initially placed into a visual sensory store, called iconic store. Auditory information entering the brain through the ears is initially placed into a sensory store corresponding to audition, called echoic store.

Although there are other sensory stores corresponding to other modalities, psychologists have concentrated most of their research activity on iconic store and echoic store. This is because human behavior, for the most part, is based on information that is initially visual or auditory.

Sperling's discovery (1960) of iconic store began somewhat obliquely with the seemingly unrelated question: how much of a visual stimulus can a person see when that stimulus is presented for a very brief period of time? (By "very brief" it means a period of time ranging from 10 to 200 milliseconds where a millisecond is 1/1000 of a second). Sperling's major reason for investigating this question was that visual behavior in general is made up of a series of "brief visual presentations". Ask a friend to look around the room and watch his eyes as he does so. Notice that eyes do not describe a smooth, continuous motion as they move around. Instead, they are still for a brief period, quickly move to another position, are still for another brief period, move again, are still again, and so on. The periods during wnich the eyes are still are called fixations, the quick eye movements separating fixations are called saccades (saccade being French for "jump"). Visual information is taken in by the eyes during the fixation periods, whereas vision is essentially

supressed during saccades. Saccades occur at the rate of about three per second; each fixation therefore lasts for a period of about 300 milliseconds. It is seen then that the eye is constantly presenting the brain with a series of brief visual presentations in the form of fixations; therefore the question of how much a person can see during such a presentation becomes quite important.

Since the late 1800s numerous researchers, (McDougall, 1904; Whipple, 1914) have done numerous experiments dealing with this question. Arrays of items, for example, letter arrays such as those shown in FIGURE 2.3 have been briefly presented to a subject in a tachistoscope (A tachistoscope is an optical device for presenting visual stimuli very briefly).

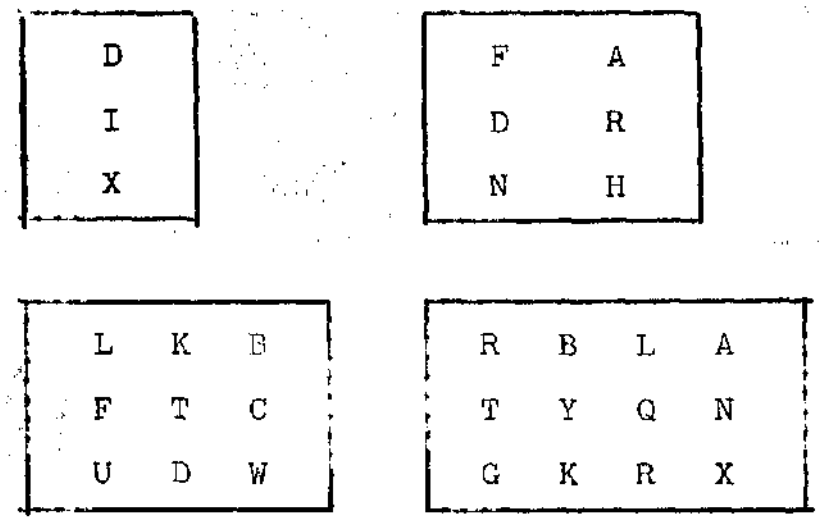


FIGURE 2.3: ARRAYS USED IN A TYPICAL EXPERIMENT TO MEASURE THE INFORMATION AVAILABLE IN A BRIEF VISUAL PRESENTATION (LOFTUS AND LOFTUS, 1976).

After he had viewed the array of letters, the subject was simply asked to report back as many of the letters from the array as he could remember. It is possible to plot the average number of letters reported by the subject as a function of the number of letters presented in the array. The results obtained by such a procedure are shown in figure 2.4 as follows:-

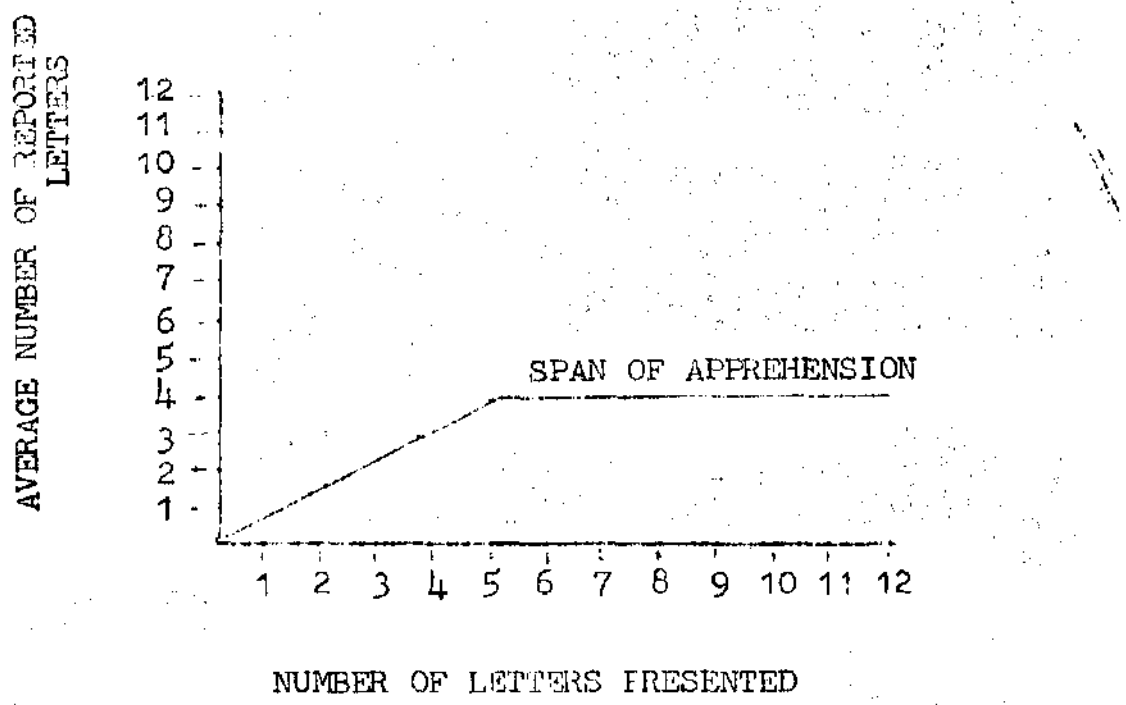


FIGURE 2.4: RESULTS OBTAINED IN A TYPICAL EXPERIMENT TO MEASURE THE INFORMATION AVAILABLE IN A BRIEF PRESENTATION (LOFTUS AND LOFTUS, 1976).

If up to about four of five letters are presented, the subject is perfect; he is able to report them all back. The initial part of the curve in figure 2.4 therefore rises linearly. However, if more than four or five letters are presented in the array, the subject is not able to report the additional letters but is still only able to report four or five. The curve in figure 2.4 therefore flattens out after four or five letters. The conclusion drawn from studies such as this typical one is that the amount a person is able to see in a single brief visual presentation is apparently constrained to about four or five items. This finding has been replicated many times and the apparent limit of four or five letters has been given a name: it is called the span of apprehension.

As with many findings in psychology, however, this experimentally determined span of apprehension was at odds with what subjects though was happening. In particular, subjects had two introspective reports that conflicted with assumptions experimenters were making about the experimental situation. It was assumed that subjects had the capability of reporting all the letters they saw in the array, that is, that what was reported constituted a completely faithful index of what was seen. It was not so as seen by the subjects. Consider an array of 12 letters. Although subjects could only report four or five of the 12 letters, it was not the case as they said that they only saw the four or five letters they reported.

Instead, it is claimed that they saw virtually all of the letters but as they were writing down the first four or five, they forgot the last seven or eight. According to this notion, then, the experimentally determined span of apprehension resulted not from a limit on how much could be seen but was instead caused by a limit on how much of what was seen could be retained.

It was also assumed that the amount of time the subjects had to perceive the array was exactly equal to the amount of time the array was presented. Again, subjects disagreed. From their point of view, it did not appear as though the array was being abruptly turned off; it appeared to be gradually fading away over the course of a second or so. It therefore seemed that they were still seeing the array for some milliseconds after it had physically vanished.

Sperling later in a partial report procedure presented, as in the whole report procedure (figure 2.4), the subject with an array for 50 milliseconds as depicted in figure 2.5. The subject was not required to report all the letters in the array.

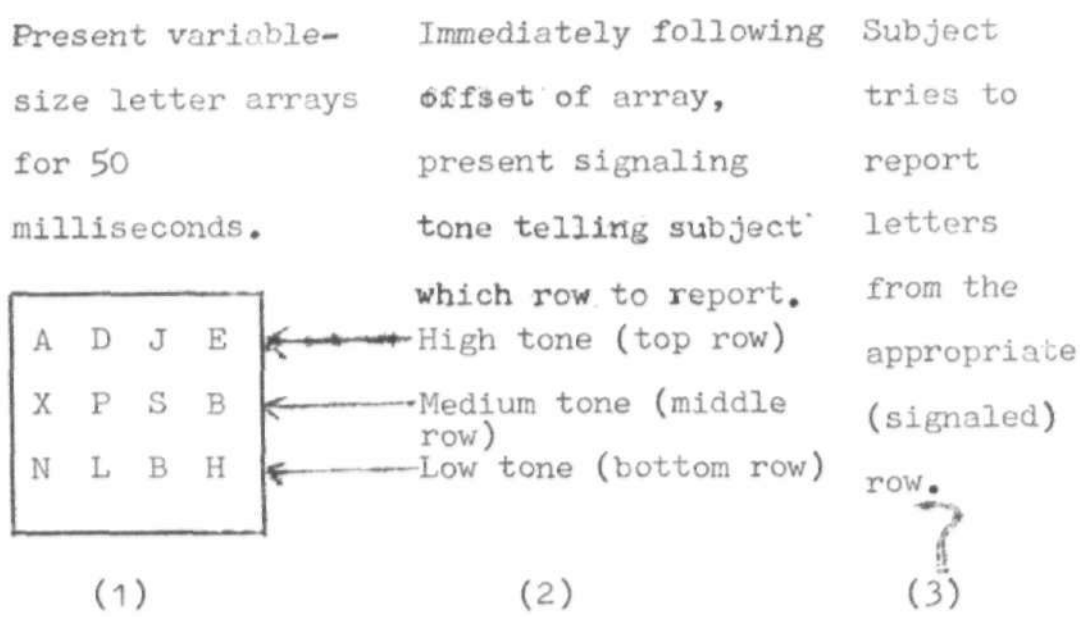


FIGURE 2.5: SPERLING'S (1960) PARTIAL REPORT TECHNIQUE

Instead he was required to report only one four - letter row. The subject was told which row to report by means of a signal that occurred immediately after the array was turned off. The signal takes the form of a tone played to the subject through earphones. A high-frequency tone indicates that only the top row is to be reported; a medium frequency tone indicates that only the middle row is to be reported; and a low-frequency tone indicates that only the bottom row is to be reported.

Using the number of letters per row that the subject was able to report using that procedure, Sperling was able to estimate the total number of letters the subject must have had available at the instant the array was turned off. Suppose, for instance, that on the average, the subject was able to report three out of four letters per row.

Because the subject did not know beforehand which row he was going to have to report, this must mean that he had three letters available from each of the three rows. The total number of letters estimated to be available would therefore be three rows times three letters per row or nine letters in all. The results of this experiment are shown in figure 2.6. For a whole report, the procedure is identical to that used in previous experiments, so the curve obtained in this condition is identical to the curve shown in Figure 2.4; it levels off at the four - five item span of apprehension. With the partial report procedure, however, the curve does not level off but continues to rise: the more letters presented in the array, the more letters are estimated to be available to the subject.

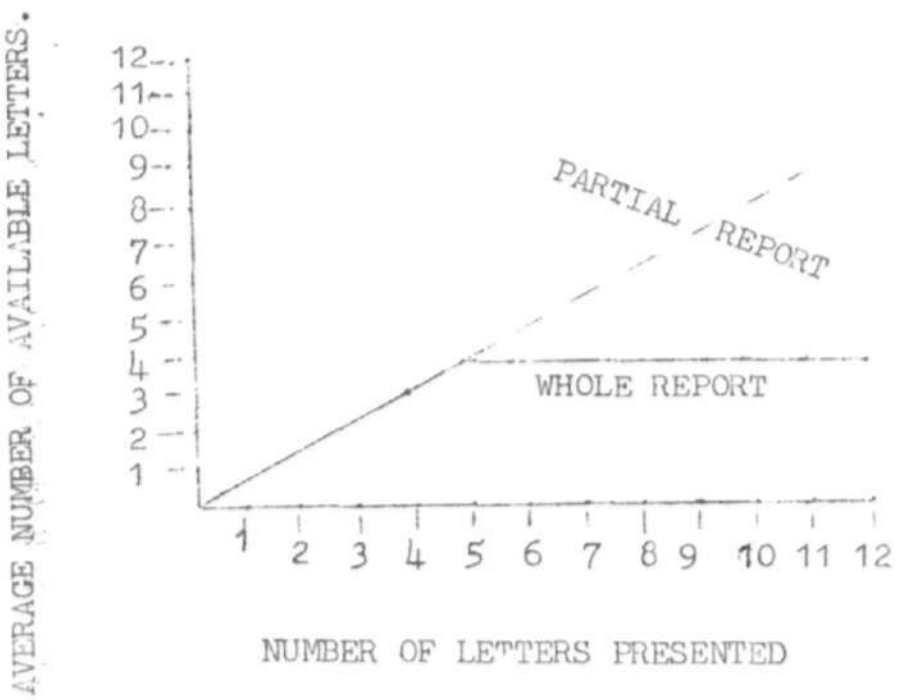


FIGURE 2.6: RESULTS OBTAINED IN SPERLING'S (1960) FIRST EXPERIMENT.

This result is very important, for it shows that the span of apprehension does not, as early experimenters assumed, accurately measure the amount of information that subjects are able to perceive. Instead, the result gives experimental support to the introspective feeling that during a brief visual presentation people are able to see more than they are ultimately able to report.

It is obvious that information held in sensory store is raw, sensory information, as yet unanalyzed for meaning (Sperling, 1960). Before information can be of any real value, it must be transferred out of the sensory store into some other store where meaning becomes attached to it.

Pattern recognition is the term used to describe the process of transferring information from sensory store to short-term store. Essentially, "Pattern recognition" is a process consisting of "recognizing" a raw, physical pattern in sensory store as representing something meaningful. It is extremely complex and not terribly well understood.

Pattern	Concept that pattern represents.
A ——→	First letter of the alphabet. Vowel Represents a good grade etc.
B ——→	Second letter of the alphabet Consonent Beginning of the word "bottle" etc.
Z ——→	Last letter of the alphabet Consonent Represents the sound of a person snoring etc.

FIGURE 2.7: SYMBOLS (VISUAL PATTERNS) AND THE CONCEPTS THEY REPRESENT.

On the left side of Figure 2.7 are shown various visual symbols while the concepts those symbols represent are described on the right side. The first symbol, for example, is the pattern "A". The concept represented by the physical pattern "A" constitutes a complex array of information, including pronunciation rules, first letter of the alphabet, first letter of the word "apple", and vowel, last letter of the word "pizza", and so on. The process of recognizing a pattern, then consists of deciding which of all possible concepts a particular pattern corresponds to.

It is currently believed that this task is carried out via a feature - detection analysis. A particular pattern may be thought of as being made up of a collection of elementary features. The pattern "A" for example, can be thought of as having such features as two straight diagonal lines, one horizontal line, three acute angles, two oblique interior angles, etc. Figure 2.8 shows a possible pattern recognition program that analyzes the raw patterns in sensory store and ultimately makes a decision as to what concept a particular pattern corresponds.

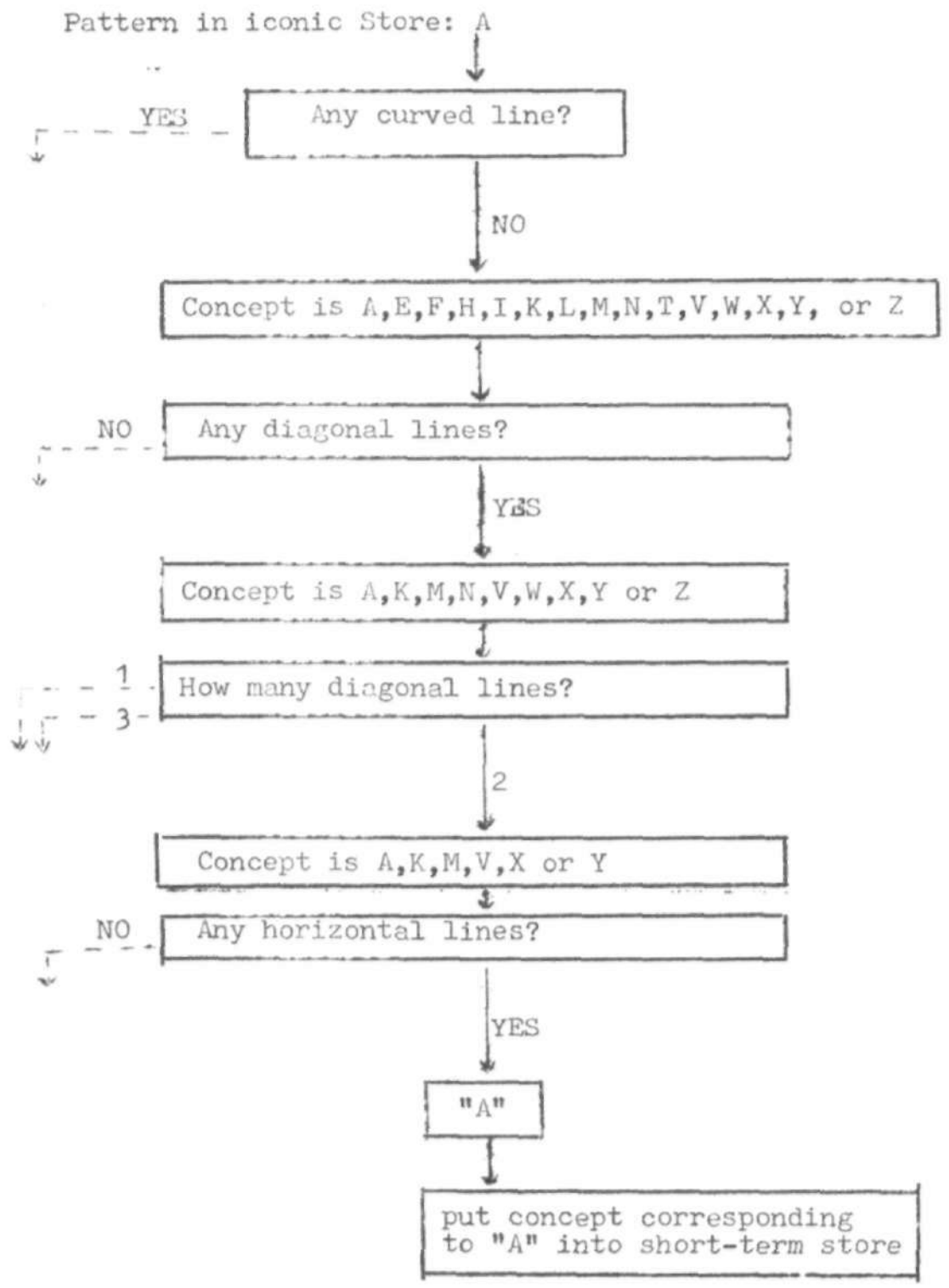


FIGURE 2.8: AN EXAMPLE OF HOW A HYPOTHETICAL PATTERN-RECOGNITION PROGRAM MIGHT RECOGNIZE THE PHYSICAL PATTER "A". (LOFTUS AND LOFTUS, 1976).

In figure 2.8, the pattern "A" is presented and goes into iconic store from the environment. The pattern recognition program then begins to work on this input information by asking a series of questions about the physical features of the pattern. Based on the answers to these questions, the possible concepts to which the pattern might correspond are narrowed down until only one is left. The first question asked by our hypothetical program is: "Does the pattern have a curved line?" Because the answer to this question is "NO", the pattern must correspond to one of the all-straight-line letters, A,E,F,H,I,K,L,M,N,T,V,W,X,Y, or Z. The next question is, "does the pattern have at least one diagonal line?" The answer to this question further restricts the set of possible concepts to A,K,M,N,V,W,X,Y, or Z. This question - answer process continues until the range of possibilities has been narrowed to one. At this point, the pattern recognizer has decided that the pattern corresponds to an "A" and the information corresponding to the concept of an "A" is placed into short-term store.

Evidence for this kind of feature - testing model comes from a variety of sources. Behavioral evidence for instance, for a feature - testing model has been gathered by Ulric Neisser and his colleagues, using what is termed as a visual-scanning task,

(Neisser, 1963, 1964, 1967; Neisser, Novak and Lazar, 1963; see Egeth, 1967). Visual scanning is what you engage in when you enter a crowded bar or restaurant and search (Scan) through the crowd to find a friend who was supposed to meet you there. Hubel and Wiesel (1959, 1962) carried out an extensive series of experiments on response patterns of individual brain cells to various types of visual stimuli. Their findings were dramatic as certain cells responded only to very specific visual patterns. For example, one cell responded only to a vertical line, another only to a horizontal line, and so forth. Such cells may therefore be viewed as elementary feature detectors and Hubel and Wiesel's confirmation of their existence provides fairly compelling support for a feature testing model.

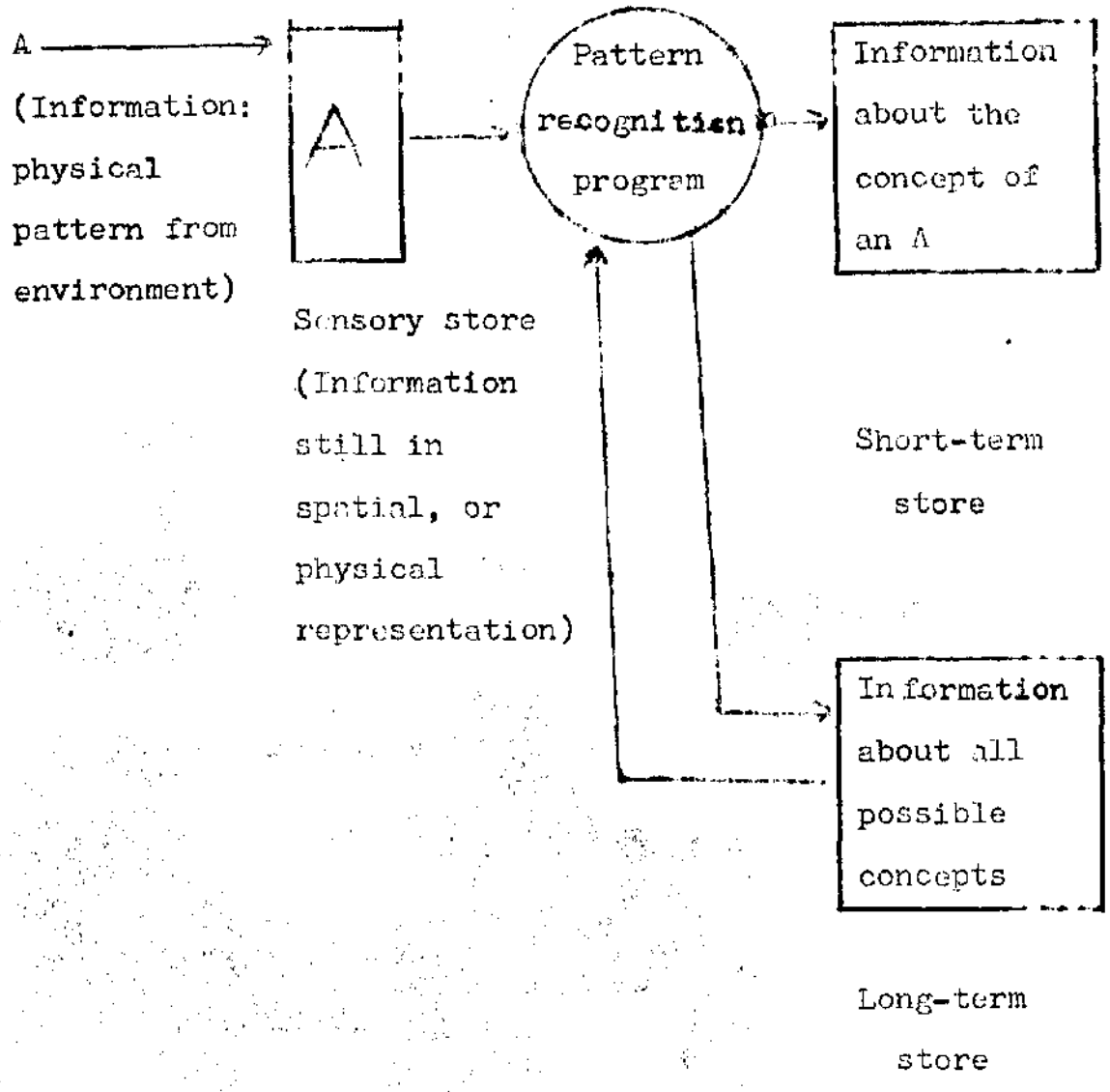


FIGURE 2.9: HOW A PATTERN-RECOGNITION PROGRAM FITS INTO THE INFORMATION - PROCESSING SYSTEM.

Figure 2.9 illustrates how the pattern-recognition process fits into the information - processing system discussed before. The physical pattern "A" enters the eyes from the environment and is placed into iconic store. The pattern - recognition program then has the job of transferring this raw sensory information from sensory store into short-term store.

In the process two things happen. First, the physical representation of the information is changed or recoded. Second, the raw sensory information from the environment is supplemented by information already stored in long-term store. To completely recognize a pattern, the program must ask a long series of questions about the pattern, and it therefore seems that the process must be long and tedious.

Sensory store can receive a good deal more information than can short-term store. Therefore, a person must make a choice about which information is to be transferred to short-term store and which is left to decay away from sensory store.

In deciding which information to transfer, one is essentially deciding to what he is going to attend. In turn, this choice is most likely dictated by the task he is trying to accomplish. Subjects in Sperling's partial report procedure, for example, had to report all the letters from a particular, designated row of the letters array (see figure 2.5). The decision of which information to transfer out of sensory store and which to let decay away is the phenomenon of attention.

2.B MODEL OF MEMORY

Besides Atkinson - Shiffrin Memory Model (Figure 2.2) George Sperling (1967) proposed a model of short-term "store". His model simultaneously incorporates the notions of attention, pattern recognition, limited capacity, rehearsal, and auditory information storage. Figure 2.10 below shows Sperling's model of short-term store.

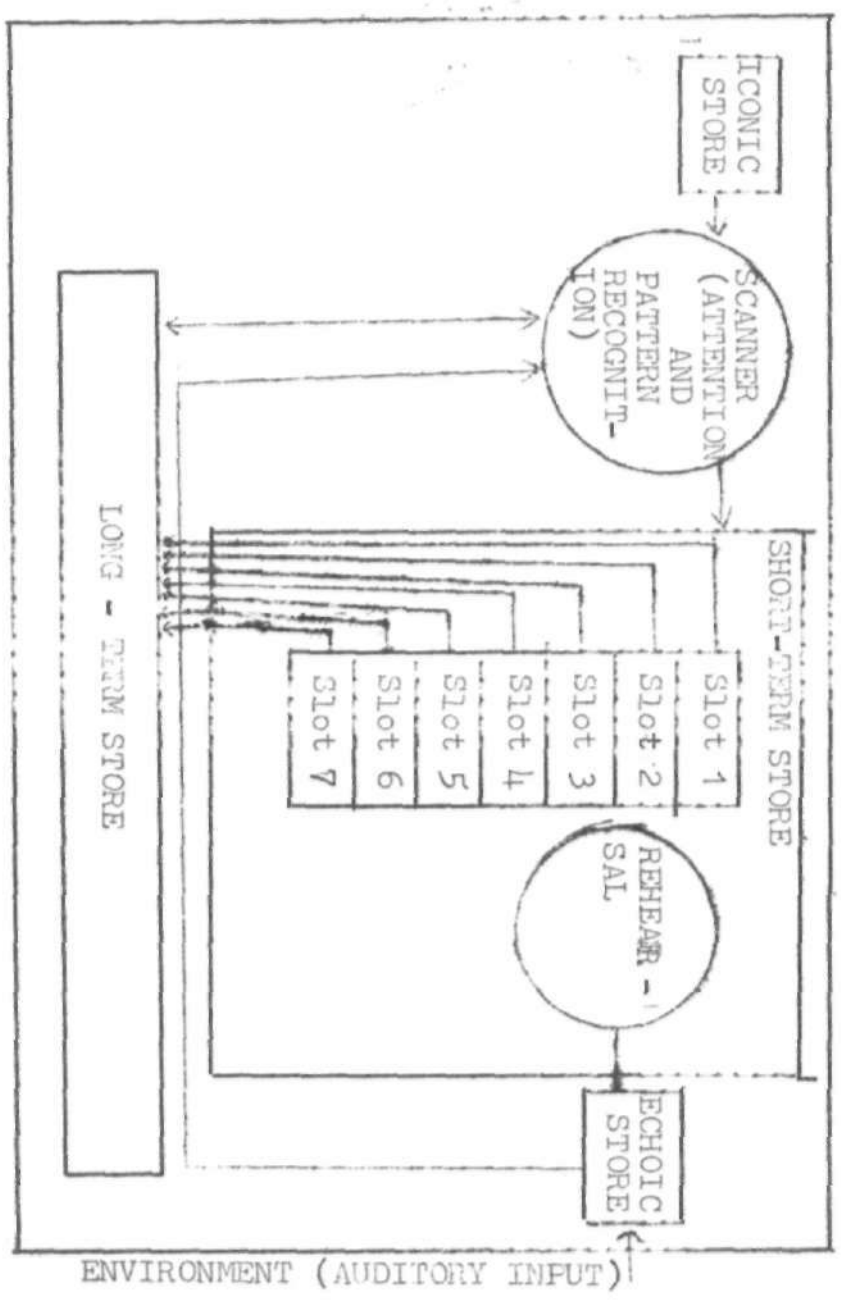


FIGURE 2.10: A MODEL OF SHORT-TERM STORE (SPERLING, 1967).

The large box in the above figure represents a human being, and everything outside it represents the environment. Information enters the human being either through the eyes (represented by arrow coming into the left-hand side of the box) or through the ears (represented by the arrow coming into the right-hand side of the box). Visual information goes directly into iconic store, whereas auditory information goes directly into echoic store. Information in either sensory store is processed by a "scanner", which includes both attention (it decides which information to process) and pattern recognition. The circles process information whereas the boxes hold information. The result of the scanner's operation is to fill up seven slots in short-term store with one chunk of information per slot. It is not the actual information that goes into a particular slot but rather a pointer to the area of long-term store where the actual information resides. This notion is reflected by the arrows in the model connecting each short-term store slot with the appropriate area of long-term store. The next component of the model is rehearsal process. The rehearsal component, which can be thought of as a "mind's voice", goes successively through each slot creating an auditory representation of the information identified by the slot. The auditory representation then acts as a new auditory stimulus and is placed into echoic store

where any auditory stimulus is placed. The scanner then reoperates on echoic store, replacing the information into its appropriate slot, and the information in short-term store is thereby continuously recycled.

The models of Sematic Memory, that is, network models, set-theoretic models and feature-comparison models are of interest and worth discussing especially when one is writing on the phenomenon of memory. Collins and Quillian (1969) in their paper "Retrieval time from semantic memory" speculated that the items in semantic memory are connected by links in a huge network. Figure 2.11 presents a portion of their hypothetical memory structure.

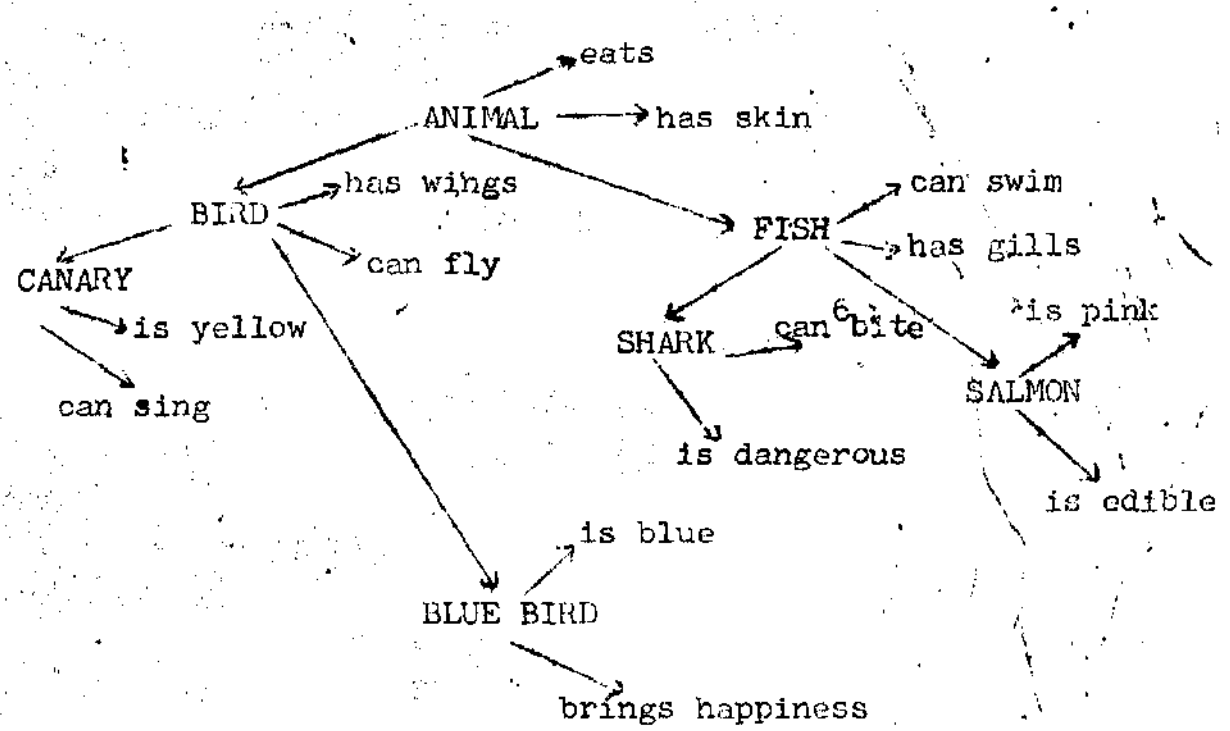


FIGURE 2.11: A PORTION OF A HIERARCHICALLY ORGANIZED MEMORY STRUCTURE. (After Collins and Quillian, 1969).

It is seen from the above figure that the concepts in the structure are hierarchically organized into logically nested subordinate - superordinate relations. For example, that "CANARY is BIRD" is subordinate to the superordinate, "Canary is yellow". It is to be noticed further that a property characterizing a particular class of things is assumed to be stored only at the place in the hierarchy that corresponds to that class. This assumption has been called the assumption of "Cognitive economy". For example, a property that characterizes all birds (such as the fact that they have wings) is stored only at BIRD. It is not stored again with the different types of birds, even though other types of birds also have wings.

According to Collins - Quillian model, a person should answer the question "Is a collie (a type of a dog) a mammal?" faster than the question "Is a collie an animal?" However, people don't (Rips, Shoben and Smith, 1973). Similarly, people will take longer time to answer "Is a cantaloupe a melon?" than to answer "Is a cantaloupe a fruit?" even though melon is logically closer to cantaloupe in a semantic hierarchy (Rips et al, 1973). Findings such as these cause trouble for Collins and Quillian and it is imperative to accept the possibility that all concepts are connected directly to all other concepts. COLLIE, for instance, may be "farther" from MAMMAL than from ANIMAL, possibly because it is a less frequent associate.

Following the lead of Katz and Fodor (1963), Smith et al (1974) observed that the meaning of any item in memory can be represented as a set of semantic features. First, there are those features which are essential aspects of the item's meaning. These are known as <u>defining features</u>. Conversely, other features do not form part of the item's definition, but are nonetheless <u>characteristic</u> or <u>descriptive features</u> of the item. For example, the defining features of the word robin, that is, some features that must be true of robins may include "living", "have feathers", "have wings" and "have red breasts" while the characteristic features, that is, features that may be associated with robins but which are not necessary to define a robin could include features such as "like to perch in trees", "undomesticated", "harmless", and "smallish". In situations where a subject must decide whether an instance is a member of a category, it is assumed that the sets of features corresponding to the instance and the category are partitioned into the two subsets corresponding to defining and characteristic features. Figure 2.12 illustrates this partitioning for ROBIN and for BIRD.

	CONCEPTS	
	ROBIN	BIRD
Defining features	Is living	Is living
	Has feathers	Has feathers
	Has wings	Has wings
	Has a red breast	'
	.	'
	.	'
	.	'
Characteristic features	Flys	Flys
	Perches in trees	'
	Is undomesticated	'
	Is smallish	'
	'	'
	'	'
	'	

FIGURE 2.12: THE MEANING OF A CONCEPT IS DEFINED IN TERMS OF SEMANTIC FEATURES. (SMITH ET AL, 1974).

The process of verifying whether an instance is a member of a category is assumed to be accomplished in two major stages which are schematized in the flow chart of figure 2.13 as follows:-

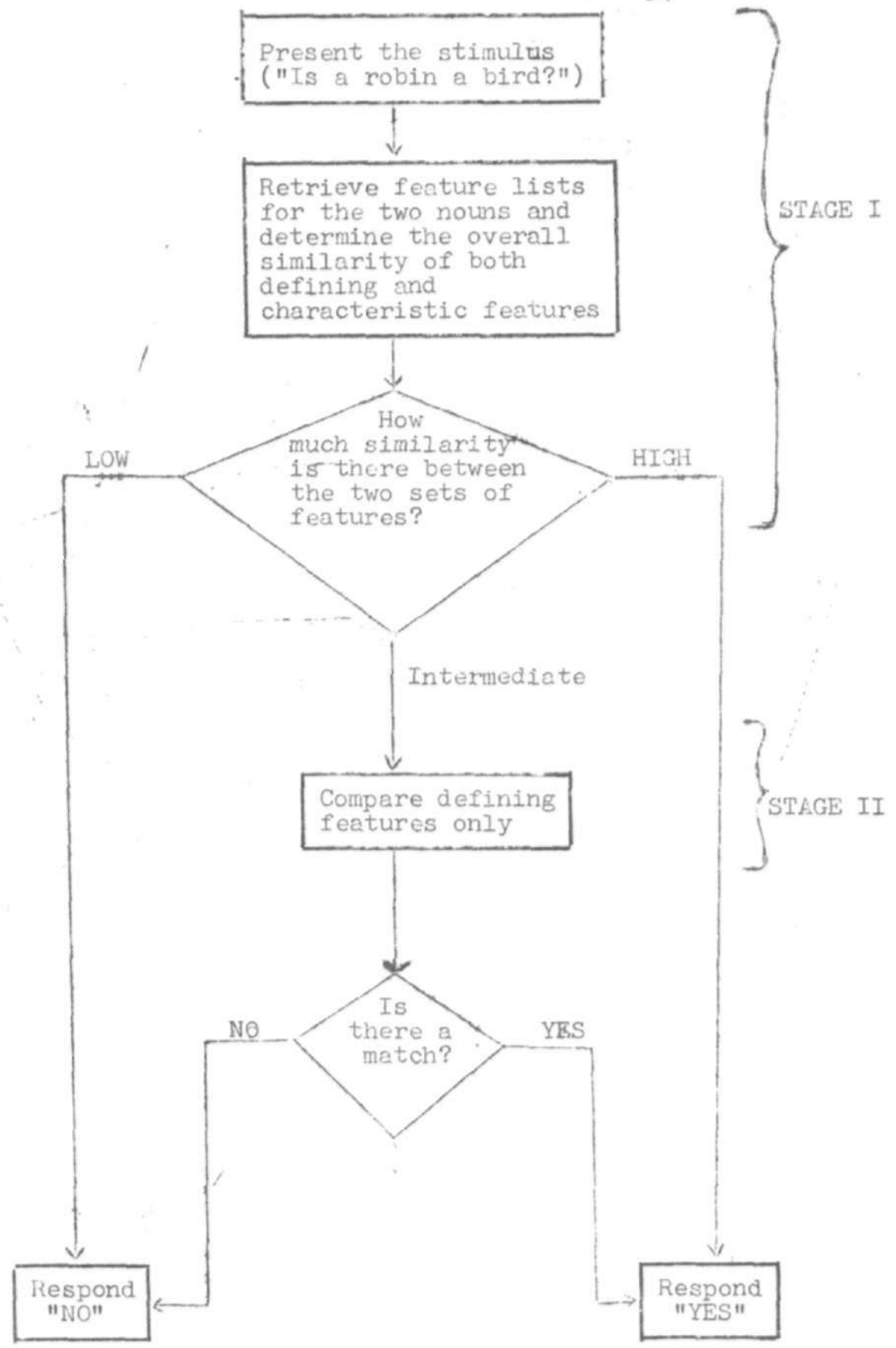


FIGURE 2.13: THE FEATURE COMPARISON MODEL FOR THE VERIFICATION OF SUCH STATEMENTS AS "IS A ROBIN A BIRD?" (AFTER SMITH ET AL, 1974).

The first stage involves a comparison of both the defining and the characteristic features of the instance and the category to determine the degree to which the two sets of features are similar. If there is a high degree of correspondence between the instance features and the category features, the subject responds "Yes" immediately. If the two sets of features have very little correspondence (low similarity), the subject can respond "NO" immediately. If, however, there is an intermediate level of similarity between the features of the instance and the features of the category, then a second stage is needed before the subject can reach a decision. In the second stage, the subject compares only the defining features of the instance and the category. If all the defining features of the instance, category are also defining features of the then a "Yes" response is made; otherwise the subject responds "No".

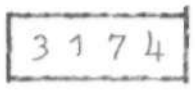
Collins and Quillian (1969) found that people take much time to verify that a canary is an animal than they take to verify that a canary is a bird. This result may be explained simply by assuming that the features of CANARY overlap more with those of its immediate superordinate, BIRD, than with those of its less immediate superordinate, ANIMAL. In the former case, then, stage 2 processing is more likely to be omitted. This therefore, is in line with the typicality effect (Rips, Shoben, and Smith, 1973; Rosch, 1973; Wilkins, 1971).

2.C INFORMATION RETRIEVAL

Information residing in short-term store can be retrieved and used rapidly and efficiently. Sternberg (1966, 1967, 1969a, b) developed an experimental paradigm which has been extremely useful in examining short-term information retrieval. The task that was used by Sternberg is shown in figure 2.14 as follows:-

i. Storage phase

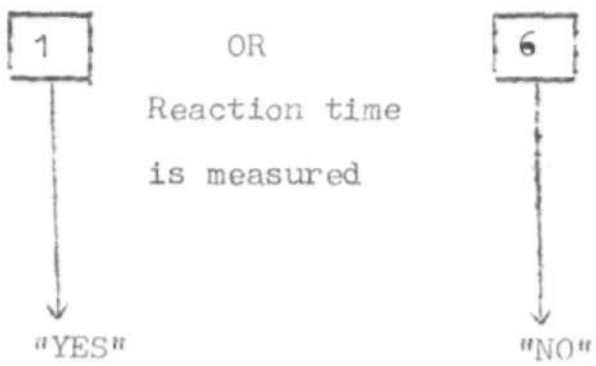
A Memory set is presented



B Subject enters memory set into short-term store.

ii. Retrieval phase

A Test digit is presented



B Response is made.

FIGURE 2.14 A TRIAL IN THE STERNBERG (1966) PARADIGM.

A given trial in the above paradigm consists of a storage (study) phase and a retrieval (test) phase. In the storage phase, the subject is read or shown a string of items (for example, digits), which he places in his short-term store. This string of items is referred to as the memory set. When the subject is satisfied that he has the memory set in short-term store, he presses a bottom that initiates the retrieval phase of the trial. In the retrieval phase, a single item (the test item) appears and the subject simply has to report whether the test item was or was not a member of the memory set. In the paradigm, the memory set consists of the digits 3, 1, 7 and 4. If the test item were, for example, a 1, the correct response would be "Yes", whereas if the test item were, for example a 6, the correct response would be "No". The response is not actually a spoken response, but is made by pressing a bottom. One bottom corresponds to "Yes" and a second bottom corresponds to "No". Subjects were instructed to respond as quickly as possible but to avoid making errors.

Using the Sternberg paradigm, we can investigate a major and basic question about retrieval of information from short-term store: Is all the information in short-term store searched in parallel and the desired information simply "plucked out" or is it necessary to search sequentially (item by item)? To answer this question, Sternberg simply varied the amount of information in short-term store - that is, the size of the memory set. By looking at the

function relating reaction time to memory set size, we can now distinguish between the parallel and sequential hypotheses. If a parallel search is made of all information in short-term store, then the number of items in short-term store should have a relatively minor effect on search time. Conversely, if information is examined sequentially, then the more items in short-term store to be searched through, the longer the search should take. In other words, the sequential hypothesis predicts that reaction time should increase as a function of memory set size.

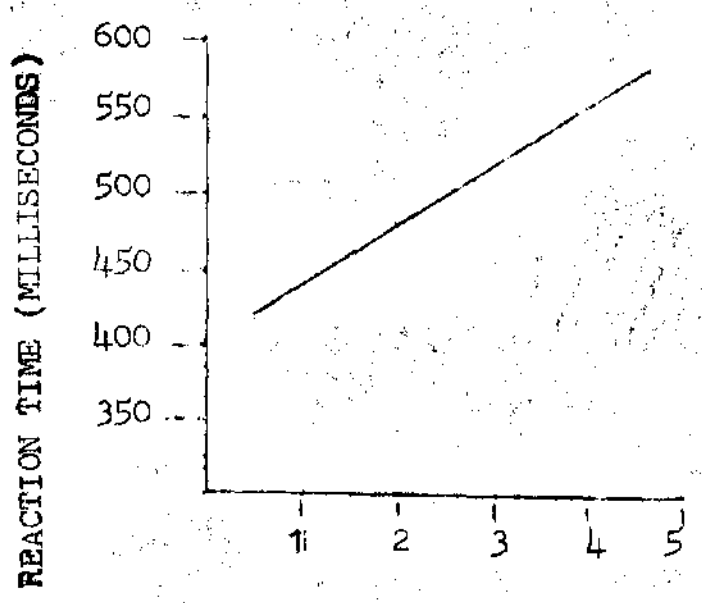


FIGURE 2.15: RESULTS OF THE STERNBERG (1966) EXPERIMENT.

Figure 2.15 shows the results of Sternberg's experiments. There are several interesting aspects of his data. First, the fact that the curve rises suggests that

a sequential search was involved. Second, the fact that the curve is linear has led Sternberg to postulate a fairly specific model of the retrieval process in terms of processing stages.

Sternberg postulates that the reaction time to respond is made up of several independent stages, each stage taking some amount of time. The stages are assumed to be roughly as follows:

Stage I: The test digit is read and encoded (pattern recognized).

Stage 2: The encoded form of the test digit is successively compared with each member of the memory set. Each comparison consists of a determination of whether a match exists between the test item and the memory item with which it is being compared.

Stage 3: Based on whether or not a match was found a decision is made to respond "Yes" or "No" and the response is executed.

Adding up the times for these three stages, we find that reaction time (RT) may be expressed by the following equation:-

RT = stage 1 + stage 2 + stage 3.

A sequential search of long-term store may take a person longer time before he finds an answer to a question. Norman (1968) has pointed out that if we have stored N items in memory, a sequential search takes approximately N/2 attempts to find any specific

item. With such a large system as long-term store, such a search strategy is obviously impractical.

Alternatively, the retrieval system may contact only those locations indicated in the question asked of it. After direct contact takes place, the system then searches this information in more detail. This notion of a direct contact search scheme is favoured by many psychologists. The search is thought to be "limited" in the sense that we do not continue searching forever. We have "stop rules" that tell us when to give up the search. For example, we may try to think of the capital of California for 1 minute, and then give up if we cannot think of it. A "direct contact - limited search" mechanism is quite reasonable; for one thing, it predicts that our ability to find an item we are looking for depends on how large the set is in which we are searching. If the search set is very large, the stop rule is likely to be applied before we find the item we are looking for.

Hopkins and Atkinson (1968) conducted a two-stage experiment. In the first stage, subjects studied a list of 75 proper names of well-known people and then tried to write down as many of the names as they could remember. The next day, they were shown a series of 150 pictures, one at a time, and their job was to name the person in the picture. Seventy-five of the 150 pictures corresponded to names that had been on the previous day's list. For half of the trials,

the subject was "informed" as to whether he had or had not studied the name the day before. The experiment therefore had four different conditions. The mean proportion of times the subject correctly reported the name in each of the four conditions is shown in figure 2.16 as follows:-

	Studied	Not Studied
Informed	.46	.26
Not Informed	.40	.26

FIGURE 2.16: MEAN PROPORTION OF TIMES THAT THE CORRECT RESPONSE WAS GIVEN IN THE HOPKINS AND ATKINSON (1968) EXPERIMENT.

Notice that the subjects did much better on pictures of people whose names they had studied than on pictures of people whose names they had not studied. Because the set of all studied names is a much smaller set than the set of all names of famous people, it is no surprise that the subject did better on studied names. However, the difference between studied and non studied is not the most interesting finding in this experiment. If there really is some loss in long-term store then the non studied pictures may have been worse off because they have had more time to suffer the loss. The interesting difference in this experiment is between the informed and noninformed conditions for subjects who had studied the names

(.46 versus .40). Because this information was given at the time the subject was attempting to recall the name, the differences in performance cannot be attributed to differences in the way the two types of pictures had been stored. The recall differences for informed versus non informed must be because the informed condition has provided an additional retrieval cue.

Tulving and Thomson (1973) revealed some more striking findings of the power of a retrieval cue: under certain conditions a subject can completely fail to recognize a word he has learned, yet he can immediately recall that word when provided with the right retrieval cue. For example, if the subject had been given the underlined words on the left as stimuli, he might have responded with the words in the right:

<u>lake</u>	boat, fish, swim, water, cold, blue, breeze
<u>eat</u>	food, fruit, flower, picnic, lunch, dinner, fish.
<u>night</u>	day, sky, open, black.

Memories that may cause us great unhappiness if they were brought to mind often appear to be "forgotten". However, are they really lost from memory or are they simply temporarily repressed as originally suggested by Freud (1922)? Repression is the phenomenon that prevents someone from remembering an event that can cause him pain and suffering. One way that one can know

that these memories are repressed and not completely lost is that the methods of free association and hypnosis and other special techniques used by psychoanalysts can be used to bring repressed material to mind and can help a person remember things that he has failed to remember earlier. . Zeller (1950), for example, arranged a situation so that one group of students underwent an unhappy "failure" experience right after they had successfully learned a list of nonsense syllables. When tested later, these subjects showed much poorer recall of the nonsense syllables compared to a control group, who had not experienced failure. When this same "failure" group was later allowed to succeed on the same task that they had earlier failed, their recall showed tremendous improvement. This experiment indicates that when the reason for the repression is removed, when material to be remembered is no longer associated with negative effects, a person no longer experiences retrieval failure.

Many theorists (Kintsch, 1968, 1970a, b; Anderson and Bower, 1972) are of the opinion that the act of recall consists of two major subprocesses. These processes are depicted in figure 2.17 as follows:-

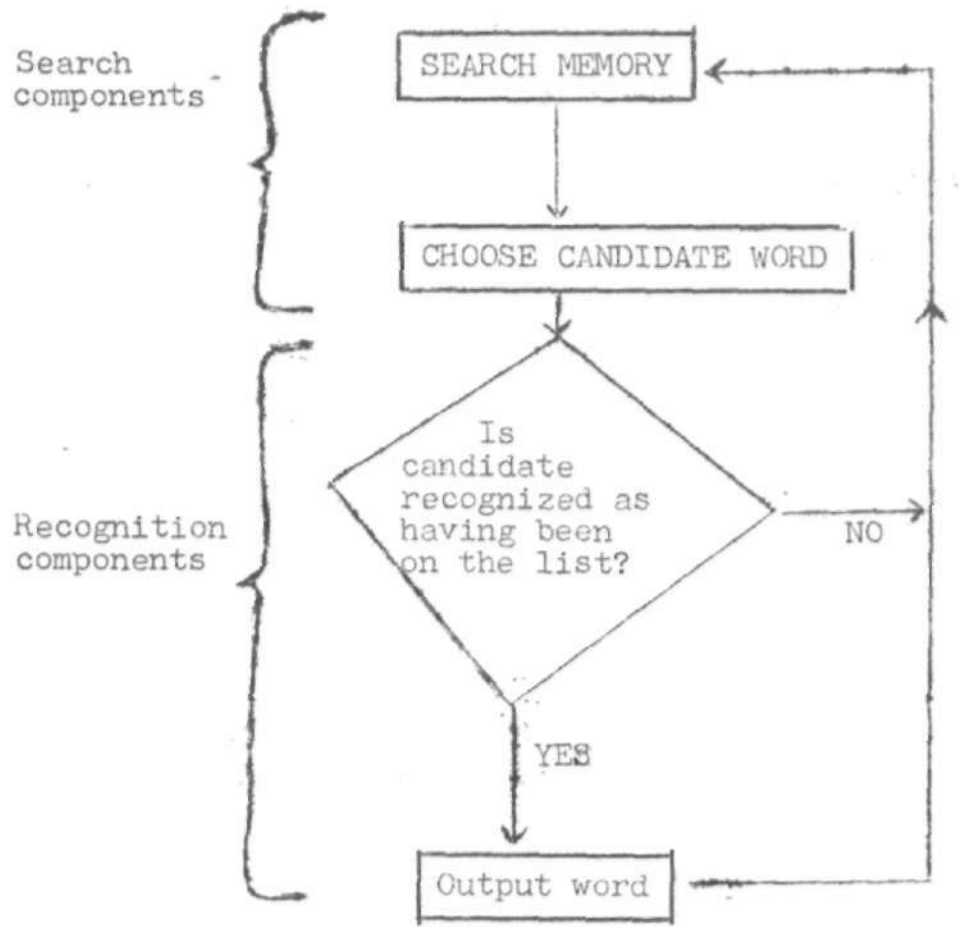


FIGURE 2.17: PROCESSES INVOLVED IN RECALL

The two major subprocesses are as follows, viz:- First, memory must be searched in an effort to locate the desired information. In the situation shown in figure 2.17, the subject searches through long-term store trying to find potential candidates for words that have been on the list. Once a candidate has been located, a recognition test must be performed on it to ascertain whether it is a correct candidate. If a candidate is indeed recognized, then it is given as a response; otherwise, it is rejected and search continues. In a recognition test, however, only

the second component of the process is necessary; no memory search is needed because the correct information is directly available to the subject.

Retrieval of information from semantic memory at times involves successive scanning. For example, if one is asked for the name of the first President of the United States. He may "go" to the place in his memory where "presidents" are located and scan one by one until he finds the one that is coded "first president". Hopefully, it is George Washington. If asked to name a fruit beginning with the letter 'P', he may go to his "fruits" and scan them one by one until he finds one beginning with 'P'. This is what is referred to as successive scanning.

Alternatively, retrieval may not involve successive scanning of the contents of memory store. As an example of what may be happening if a person is not scanning successively, suppose again that he is asked for the name of a Republican President. He may go to the location in his memory where "Presidents" are stored, and there he may find a sub-category of "Republican Presidents" as shown in figure 2.18 as follows:-

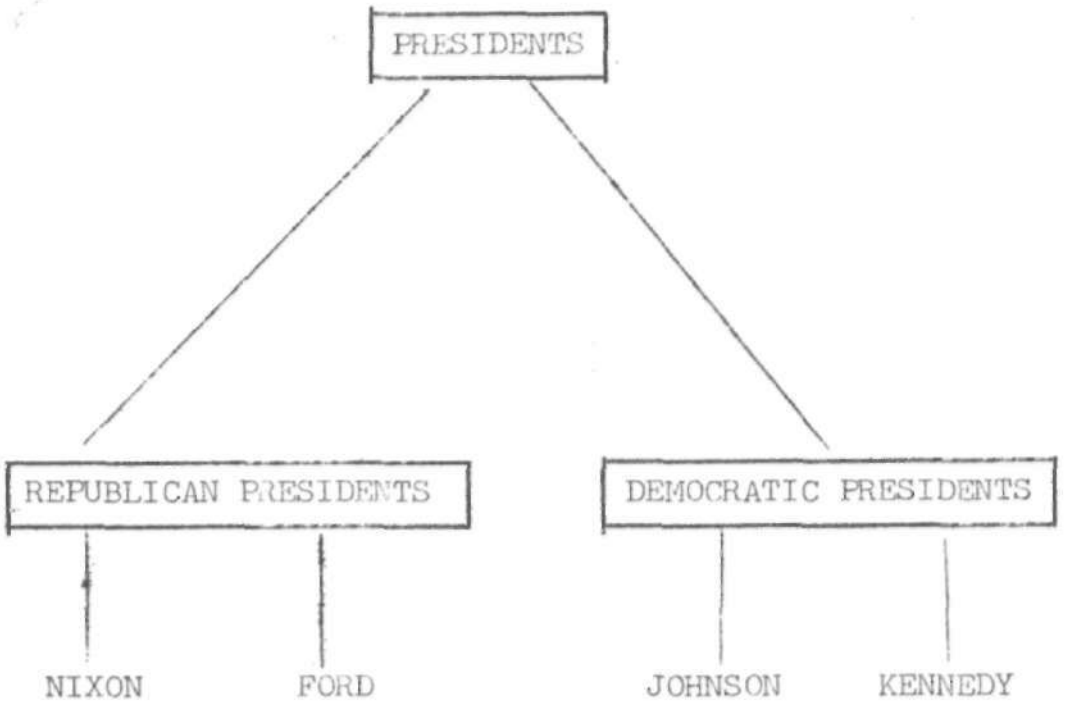


FIGURE 2.18: HYPOTHETICAL PORTION OF SEMANTIC MEMORY CONTAINING INFORMATION ABOUT PRESIDENTS.

He may enter the subcategory and pick the first item he finds there. The basic point to be noted is that information is retrieved by some process.

2.D EFFECTS OF SUMMARY ON RECALL

Summaries, either before or after a text, or on a separate page and placed either before or after the text are said to aid recall of information from such texts.

Hartley and Burnhill (1978) stated that summaries at the beginning of articles help the readers to organize their thoughts about what is to follow and summaries at the end of articles are useful for review purposes, especially if the main points made in the paper are given again. It is clear from the above statement that summaries will, to a large extent help the learner in the organization of his thoughts before reading a text when such summaries are at the beginning of the text. And, when the summaries are at the end of the text, they help him in reviewing the important points in the text.

Brown, Campione and Day (1981) reported that the ability to summarize changes with age and experience. In this respect, summaries will be of tremendous help to the "immature" in their learning if and when the materials provided for learning are accompanied with some kind of summaries.

Hartley and Trueman (1982) investigated the effects of summaries on the recall of information from prose by undertaking five experimental studies using university students and comprehensive-school pupils. They found that the subjects of their studies

who had summaries performed better than those subjects who had no summaries at all. However, their findings on the effects of summary position i.e. either before or after the text, were inconsistent as evidenced in their second and third experiments (Hartley and Trueman, 1982: Experiments 2 and 3).

McGlaughlin-Cook (1979) found that by placing the summary on a separate page before the text instead of separating it typographically, the performances of his subjects on recall increased considerably. This finding, probably, would have been different if the summary on the separate page were placed at the end of the text.

The effects of summary, before and after a text, as found by some researchers vary to some extent and this can be explained by some factors, such as the nature of the learning materials, the I.Q of the subjects etc. Simple learning materials can easily be recalled whether they are placed at the beginning or at the end of a text and students with high I.Q are likely to perform better in their recall of information from a text, the position of the summary notwithstanding.

2.E EFFECTS OF SUMMARIES IN THE FORM OF FLOW-DIAGRAMS ON RECALL

A flow diagram in the form of algorithmic chart is a convenient way to present the temporal sequence of the events of any narration of descriptive passage. It has two distinct advantages, that is, firstly, it arranges the salient features of the passage in several small components and secondly, it has the advantage of pictoral presentation impinging on the iconic store of the model of memory. The manner in which these separate boxes are to be read is always designated by arrow heads. These arrow heads do not imply anything but tell the reader how his vision should be directed from which box to which. It has already been pointed out in the foregoing passages that our eyes move in jerks from one place to another in our visual field. In between any two consecutive positions of our eyes in such jerk movements there are pauses called saccades when we virtually see nothing. These gaps in our visual attention usually called span of apprehension aid the reader follow the flow diagrams with some pause which helps the short-term store to rehearse the experienced materials or the materials in the previous boxes of the flow diagram to be retained in the long-term store for future recall. Flow diagrams therefore not only act as a kind of summary but also make use of the inherent features of memory

mechanisms for future recall of the learned or the experienced materials. An example of the flow diagram from a descriptive passage in history is shown in appendix II, Groups C and D.

Skemp (1962) emphasized the development of schematic learning theory which will have direct application to problems of teaching and learning school subjects. In his experiment he used symbols such as circles, squares, triangles, arrows, etc representing words and making various combinations of these symbols meaningful sentences could be constructed and vice versa. The result of his experiment supported his theory.

Mukherjee (1968) used Grammar School Children as subjects in an empirical study on problem - solving using codes i.e. symbols, such as arrows, triangles, squares etc to represent X, Y, Z etc of algebraic simultaneous equations, and found confirmatory results in transfer of learning experiment. It will be worth while for the investigator to find out the effects of summary of flow diagrams in the form of algorithmic charts on the future recall of prose passage by school children.

2.F SUMMARY

In exploring the memory system it is noted that information from the environment is first placed into sensory store.

Sensory store holds a large amount of information- essentially all the information impinging on a given sense organ. Information in sensory store takes the form of raw, sensory patterns as yet unanalysed for meaning.

It is to be noted too that information decays from sensory store very quickly. However, portion of the information in sensory store is transferred out via the process of pattern recognition. Pattern recognition is the process of attaching meaning to a sensory pattern and probably consists of testing for the presence or absence of elementary sensory features. The decision of which information to transfer out of memory store and which to let decay away is the phenomenon of attention.

Information in short-term store is retrieved via a sequential, exhaustive search and sequential search of long-term memory is often time consuming but with proper retrieval cues recall is facilitated.

Recall involves a memory search whereas recognition does not require such a search. In respect of retrieval of information from semantic memory, whether through successive scanning or otherwise, some kind of process is often involved.

The model of memory illustrates how information is processed both in the short-term and long term "stores" while the models of semantic memory show how concepts are attained (figures 2.11, 2.12, and 2.13).

Hartley and Burnhill (1978) stated that summaries at the beginning of articles help the readers organize their thoughts before reading them but when the summaries are placed after the articles they aid in reviewing the important points in the articles so read.

The investigator has also discussed the importance of summaries in the form of flow-diagrams of algorithmic charts on learning and retention which will also form a part of this study.

The next chapter deals with the aims and hypothesis of this study.

CHAPTER III

AIMS AND HYPOTHESIS

AIMS

From the foregoing résumé of the relevant literature of the previous chapter the aims of the study were to examine what would be the effects on retention of some meaningful prose text materials if these materials are presented with different types of summaries in different positions for different comparable groups of secondary school children. These summaries could be in the form of marginal notes for every paragraph or for every two paragraphs, or summary for every paragraph either before or after, or summaries in the form of flow diagrams of algorithmic charts placed either before the entire text or after the entire text.

The above mentioned aims will be examined using the following null hypothesis (HO),Viz, -

NULL HYPOTHESIS (HO):

There will be no significant differences among the mean retention scores of different comparable groups presented with the prose text materials with different forms of summaries with different positions, for example, marginal notes for every paragraph or for two paragraphs, summary for every paragraph placed either before or after each paragraph, and summaries in the form of flow diagrams of algorithmic charts for the entire text placed either before or after the entire text. The next chapter is concerned with the experimental methodology of this study.

CHAPTER IV

EXPERIMENTAL METHODOLOGY

THE SAMPLE

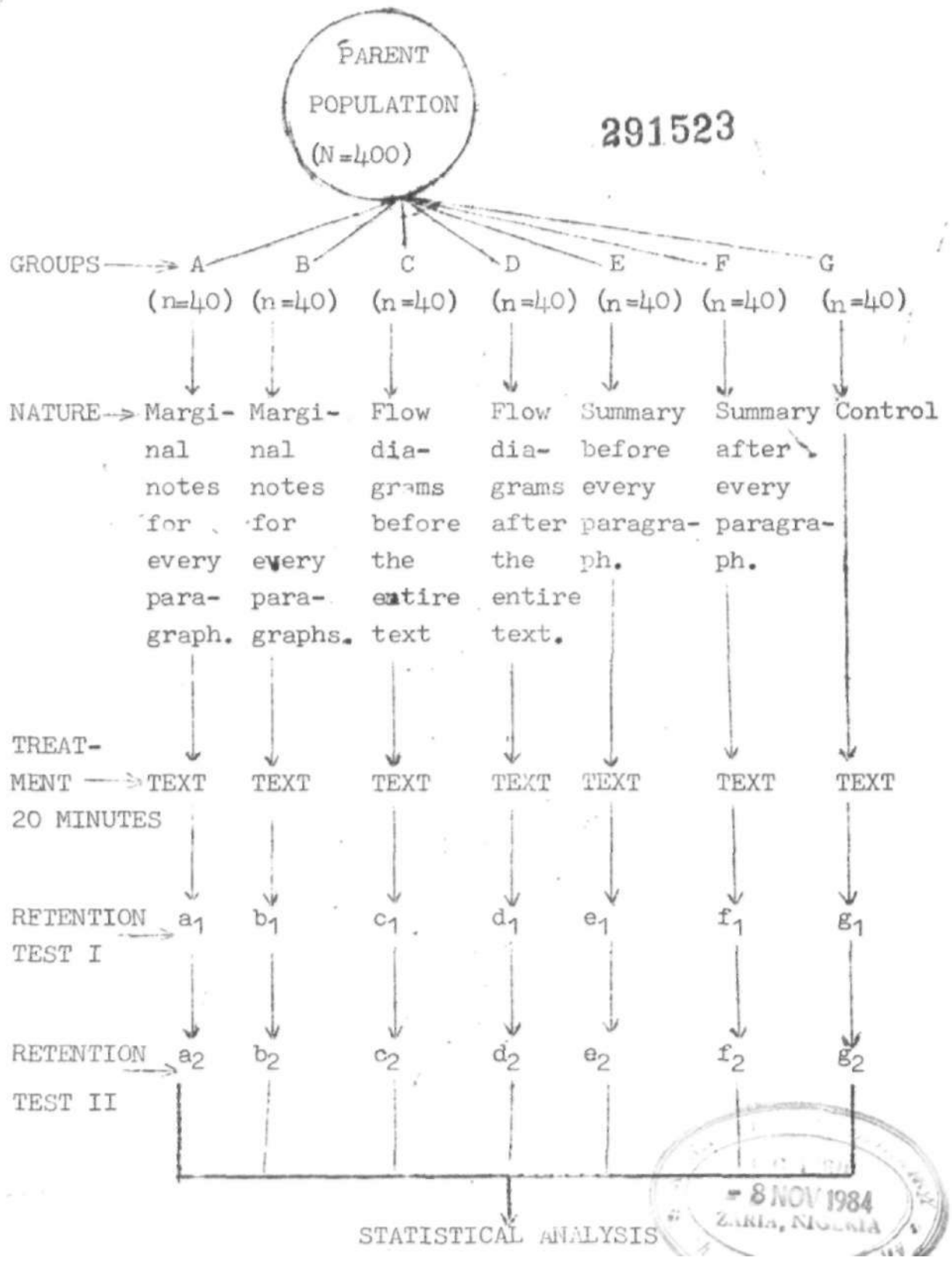
The parent population (N = 400) of the sample of this study were all boys, students of forms four and five of Kagoro Secondary School, Kagoro; Kaduna State, Nigeria. The investigator obtained the class registers of these children and shuffled them before making a list of the names of these children. When the list was made the investigator gave the children on the list serial numbers starting from 001, 002,---- 009, 010, 011, ----- 099,100, 101 ------ to 400. The parent population subjects were thus identified by numbers which were randomly allocated since the registers were initially shuffled. Using a table of random numbers the investigator started reading off three digits numbers falling between 001 to 400 and as these numbers were predicted the subjects were identified and placed in one of the seven groups in such a way that the first predicted random number identified the first subject for the first group, the second predicted random number identified the first subject for the second group, the seventh predicted random number identified the first subject of the seventh group, the eighth predicted r random number identified the second subject of the first group, and so on till each group had 40 randomly assigned subjects from the parent population. In other words, the samples of the seven groups had 40 subjects in each group. The above method of random sampling justified the underlying asumption of randomness since each subject had an equal chance of falling in any of the seven groups of this research.

RESEARCH DESIGN

The research design of this study is shown in the following design, viz:-

FIGURE - 4.1

RESEARCH DESIGN



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TEXT MATERIALS

The prose text used as the learning materials was obtained from A short history of West Africa: A.D. 1000-1800, Osae, T.A. and Nwabaya, S.N, 1968, 40 - 42. This is shown in Appendix - I of this dissertation. The marginal notes and the summary for every paragraph and the flow diagrams in the form of algorithmic charts were constructed by the investigator and they were presented in the form following the research design mentioned before. The control group had no summaries of any type. All these six different treatments excepting that of the control group are collectively shown in Appendix - II of this dissertation.

RETENTION TEST

The investigator designed the retention text consisting of twenty(20) questions taken from the entire text. These questions were shuffled before the final form of the text decided upon in such a way so that if question number one related to something in the middle of the prose text, question number two related to something mentioned at the beginning of the prose text and so on. This was deemed necessary to prevent the subjects' sequential recalling of the materials. This retention test is shown in Appendix III of this dissertation.

TEST ADMINISTRATION

The subjects of the seven different groups were administered the learning materials in separate sessions. The investigator established rapport with the subjects of each

group and gave them approprite instructions. The instruction sheet is shown in Appendix - IV of this dissertation. The subjects of each group were given a time of twenty minutes for the first reading session and then another twenty minutes that followed for further reading and remembering after which the learning materials were collected back from them. They were then given a period of five minutes rest, after which they were given the retention test for the first time, which was readministered to them after a period of three weeks as the second retention test. The retention tests were to be completed in both sessions within twenty minutes for each group.

SCORING:

The retention tests, both one and two, were scored objectively so that correct answers to the questions were scored by one make while mistakes were ignored.

EXPERIMENTAL MORTALITY:

Though the investigator had randomly obtained forty(40) subjects for each of these seven groups there were instances of some experimental mortality during the learning and testing sessions, as groups A and C had only 39 subjects each and groups E and F had 38 subjects each, the remaining groups had 40 subjects each. This could not be prevented by the investigator as some of the subjects failed to turn up during the testing sessions. The effects of these experimental mortalities are however negligible since they happened randomly for more than one group, thereby cancelling out the effects of bias on one another.

DATA MATRIX:

Besides the retention scores obtained as above the investigator obtained information of the age of the subjects. The data matrix thus consisted of the data on age and retention scores for two occasions of the subjects of each of the seven groups.

The next chapter deals with the statistical analysis of the data.

CHAPTER V

ANALYSIS OF DATA AND RESULTS:

First, the investigator wanted to examine the effect of randomization of the subjects into seven different groups by looking at the means and standard deviations of the ages of the children of these groups. TABLE - 5.1 shows the means and standard deviations of the age variable of the subjects of these groups, viz:-

TABLE - 5.1

MEANS, AND STANDARD DEVIATIONS OF AGE.

	GROUPS	N	MEAN	S.D.
	A	39	17.59	1.53
	B	40	18.30	1.62
	C	39	17.87	1.76
	D	40	18.10	2.20
	E	38	18.21	1.97
	F	38	18.42	2.15
	G	40	17.60	1.74
TOTAL	7	274	18.01	1.87

From the above table it is clear that the groups were comparable with one another since the respective sizes of the mean age of the groups were nearly the same for every group. But to check if there were any significant differences between the mean ages of these groups the investigator applied t - test on the means of the highest and the lowest age groups. Table - 5.2 shows the result of the t - test, viz:-

TABLE - 5.2

T - TEST ANALYSIS: AGE MEANS OF GROUP F AND A

GROUPS	MEAN	S.D.	N	df=n_1+n_2-2	t	p
F	8.42	2.15	38	75	1.98	N.S
A	17.59	1.53	39			

It is seen from the above table that the t - value did not reach significant level for which the estimated significant t - value needed for 75 degree of freedom for a two - tailed test was 1.99. In other words, the groups did not differ significantly from one another in terms of the age of the subjects, thereby upholding the investigator's claim of satisfactory randomization of the subjects of the parent population.

It was then necessary to find the means, standard deviations and standard errors of the means of the seven groups of subjects in respect of both Retention Test I and Retention Test

II.Tables - 5.3 and 5.4 show the results of these analysis, viz:-

TABLE - 5.3

MEANS, STANDARD DEVIATIONS AND STANDARD ERRORS

CRITERION: RETENTION TEST I

(N = 274)

GROUP	TREATMENT	N	MEAN	STANDARD DEVIATION	STANDARD ERROR
A	MARGINAL NOTES FOR EVERY PARAGRAPH.	39	11.1538	4.0752	.6526
B	MARGINAL NOTES FOR TWO PARAGRAPH.	40	10.7258	4.7555	.7519
C	FLOW DIAGRAMS BEFORE TEXT.	39	14.2051	4.5374	.7266
D	FLOW DIAGRAMS AFTER TEXT.	40	14.3250	4.1378	.6622
E	SUMMARY BEFORE EVERY PARA-GRAPH.	38	10.1316	5.1631	.8376
F	SUMMARY AFTER EVERY PARA-GRAPH.	38	10.5000	4.9525	.8034
G	CONTROL	40	4.9500	3.1861	.5038

TABLE - 5.4

MEANS, STANDARD DEVIATIONS AND STANDARD ERRORS

CRITERION: RETENTION TEST II

(N = 274)

GROUP	TREATMENT	N	MEAN	STANDARD DEVIATION	STANDARD ERROR
A	MARGINA NOTES FOR EVERY PARAGRAPH	39	10.1282	4.0986	.6563
B	MARGINA NOTES FOR TWO PARAGRAPHS	40	9.7290	4.6298	.7320
C	FLOW DIAGRAMS BEFORE TEXT	39	13.1795	4.6616	.7464
D	FLOW DIAGRAMS AFTER TEXT	40	13.5250	4.2061	.6651
E	SUMMARY BEFORE EVERY PARAGRAPH	38	9.0789	4.9940	.8101
F	SUMMARY AFTER EVERY PARAGRAPH	38	9.4474	4.8250	.7627
G	CONTROL	40	3.9500	3.0880	.4883

It is seen from the above tables that the mean retention scores of the seven different groups for both Retention Tests I and II differred from one another. The standard errors of the mean retention scores for both tests of the seven groups of subjects were at a minimal level, thereby lending further support to the satisfactory randomness of the groups.

To test if the mean retention scores of the seven different groups for both the Retention Tests I and II differ significantly from one another or not, the investigator applied One-Way Analysis of Variance tests. Tables 5.5 and 5.6 show the results of such analyses, viz:-

TABLE - 5.5

ONEWAY ANALYSIS OF VARIANCE

CRITERION: RETENTION TEST I

SOURCE	SUM OF SQUARES	df	MEAN SQUARES	F	P
BETWEEN GROUPS	2399.8975	6	399.9829	20.268	<0.0001
WITHIN GROUPS	5269.1280	267	19.7346		
TOTAL	7669.0255	273			

TABLE - 5.6

ONEWAY ANALYSIS OF VARIANCE

CRITERION: RETENTION TEST II

SOURCE	SUM OF SQUARES	df	MEAN SQUARES	F	P
BETWEEN GROUPS	2397.3384	6	399.5564	20.731	<0.0001
WITHIN GROUPS	5146.1105	267	19.2738		
TOTAL	7543.4489	273			

It is seen from the above tables that the groups differed significantly from one another in their mean retention scores ($P<0.0001$) for $df_1=6$, and $df_2 = 267$ for two - tailed test.

To test if there were significant differences between any pair of the group means of retention scores for both the retention Tests I and II, the investigator applied Scheffe Test (Ferguson, 1966). Tables 5.7 and 5.8 show the significant results of the above test for both the retention Tests I and II viz:-

TABLE - 5.7

SCHEFFE TEST: RETENTION TEST I

SEVEN GROUPS (N = 274)

GROUPS	MEAN	N	WITHIN GROUPS VARIANCE	F	REQUIRED F FOR SIGNIFICANCE $df_1=6, df_2=267$		ESTIMATED $F^1 = 3xF$ for P at diff.sign. levels		P
					0.01	0.01	0.01	0.05	
C G	14.2051 4.9500	39 40	19.7346	9.27	3.09	2.25	9.27	6.75	<0.01
D G	14.5250 4.9500	40 40	19.7346	9.704	3.09	2.25	9.27	6.75	<0.01

TABLE - 5.8

SCHEFFE TEST: RETENTION TEST II

SEVEN GROUPS (N = 274

GROUPS	MEAN	N	WITHIN GROUPS VARIANCE (S^2W)	F	REQUIRED F FOR SIGNIFICANCE $df_1=6, df_2=267$		ESTIMATED F^1 = 3x F for P at diff.sign levels		P
					0.01	0.05	0.01	0.05	
C	13.1795	39	19.2738	9.456	3.09	2.25	9.27	6.75	0.01
G	3.9500	40							
D	13.5250	40	19.2738	9.9098	3.09	2.25	9.27	6.75	0.01
G	3.9500	40							

It is seen from the above tables that the groups who obtained summaries of the entire test in the form of flow diagrams of algorithmic cherkss either before or after the test obtained significantly higher retention scores than the control group for both the Retention Tests I and II.

Lastly, the investigator wanted to examine if there were any significant differences in the mean retention scores for both the Retention Tests I and II amongst the subjects on the basis of their age differences. The results of such analysis yielded non significant F - values, thereby showing that there were no significant effects of age on the retention scores of the subjects. This is just another further result

of analysis leading still further support to the claims of the investigator about the satisfactory randomization of the subjects of the parent population into seven different groups.

RESULTS:

The results of statistical analysis of the study are summarized in the following, viz:-

(1) The groups did not differ significantly from one another in their mean ages (Tables 5.1 and 5.2).

(2) The mean retention scores for both the Retention Test I and II differed significantly from one another ($P<0.0001$, for $df_1=6$, and $df_2= 267$), for two-tailed test (Tables - 5.3, 5.4, 5.5 and 5.6).

(3) The respective sizes of the means of the retention scores for both the retention Tests I and II reveal the following features, viz:-

(a) The performances of the contrd group subjects for both the Retention Tests were the poorest of all.

(b) The performances of the groups of subjects receiving summaries of the same form i.e; marginal notes, flow diagrams of algorithmic charts or summaries for the every paragraph, were better when the summaries of entire text above type were presented after the paragraphs or the/

(c) The F - test results (Table 5.5 and 5.6) taken along with the arguments as in (2) and 3 (a), and 3 (b), show the direction of the significant differences, revealing that summaries presented in the form of flow diagrams of algorithmic charts especially after

the entire text were the best means of aiding retention than any other forms of summaries either before or after, or no summaries at all.

(4) The results of F - test for both the Retention Test I and II (Tables 5.7 and 5.8) uphold the claims mentioned in 3(c) above.

Comments on these results will be made in the next chapter of this dissertation.

CHAPTER VI

CRITIQUE, CONCLUSION AND IMPLICATIONS

A.CRITIQUE: It has been mentioned before how the seven different groups of subjects, 40 each, were obtained from the same parent population of 400 children. That the effects of randomization were satisfactory are borne out by the negligible values of standard errors of the means for both the retention tests (Tables - 5.3 and 5.4). This was achieved by allocating the first randomly predicted number as the first subject of group A, the second, as the first subject of group B ..... the seventh as the first subject of group G and the eighth as the second subject of group A, and so on, instead of obtaining all the subjects for group A first, then all the subjects for group B, and so on. Had the investigator adopted the latter method of randomization of the subjects then no subject identified by the first 40 randomly predicted numbers would have had any chance to fall in any group but A, and so on, thereby violating the underlying assumption of ramdom sampling.

As regards internal validity factors there were some experimental mortalities of one each for groups A and C and two each in groups E and F. Comments have already been made by the investigator on this point in Chapter IV. It has to be remembered here that these experimental mortalities took place before the commencement of the investigation thereby not really affecting the results of this investigation. There cannot be any question of bias entering into the results of this study arising from internal

validity factors due to experimenter decay (the investigator has to score objectively two retention tests and there was no fatigue experienced by the investigator), reactive responses (recalling meaningful prose materials is not concerned with social desirability), effects due to change in history (during the period of three weeks of data collection no historical changes, e.g; movement of populations, civil war or military coups, took place), and maturation (the average age of the subjects was 18 years far beyond the last developmental stage of Piaget). No bias could have taken place due to statistical regression towards the mean since there were no extreme groups of subjects, i.e very good or very poor in recalling abilities, and all the groups were randomized from the same parent population thereby unfolding their mutual equivalence in respect of recalling abilities. Thus according to Campbell (1969), the investigator can justifiably claim that the internal validity of this study was safeguarded. As regards external validity i.e. representativeness of the findings to wider population it is seen that each group sample size was 10% of the parent population, a figure which is highly representative of the parent population when the subjects are obtained randomly as in this study. Hence the findings of this study are representative for the parent population from which the samples were obtained and similar parent populations with the same parameters elsewhere.

Further, the control of the research design showed that all the different groups learned from printed materials with

different types of summaries in different positions (excepting the control group), and the learning time was fixed, i.e 20 minutes, for each group. The retention test were objedtively scored thereby eliminating any scope of subjective bias. On the basis of this argument it can be safely argued that if any significant differences are to be found among the different groups in their mean retention scores then that could simply be attributable to the different types of summaries and their position effects.

B. CONCLUSION

On the basis of the above argument the following conclusions are made from the results of statistical analysis reported in the previous chapter, viz:

(a) The mean ages of the subjects of the different groups were comparable with one another and there were no significant differences in age among the groups, thereby establishing that age was not a factor in the differential recalling abilities in the seven different groups (vide Tables - 5.1 and 5.2).

(b) The mean retention scores for both immediate retention and later retention of group D (having algorithmic flow diagrams of summary at the end of the text) were significantly the highest retention scores for both tests (vide Tables - 5.3 and 5.4).

(c) The mean retention scores for the control group G (having no summaries of any type at all) were the poorest of all (Tables - 5.3 and 5.4).

(d) The groups differed significantly from one another in their mean retention test scores in both tests (Tables - 5.5 and 5.6) and the direction of these significant differences followed the same pattern for both the retention tests in the following order of the highest mean to the lowest mean, viz: D,C,A, B,F, E, G. (Tables - 5.3 and 5.4).

(e) The Scheffe's tests results for both the retention tests were also significant for the following two pairs of comparison, viz; C versus G and D versus G (Vide Tables - 5.7 and 5.8).

C. IMPLICATIONS:

The implications arising out of this research cannot be overemphasized. Whenever children learn, say a prose passage, it is our main objective that they will be able to recall both the major and minor points of that passage in examinations. In most cases not all children will be able to recall what they have previously learned. The question that arises then is: How can teachers help students to learn and be able to recall learned materials? It seems that their methodology will be crucial in this respect.

It goes without saying that summaries, in whatever form, when presented together with the materials to be learned facilitate students' recall of that materials in future. But how will the teacher apply these summaries, before or after a lesson, prose passage e.t.c? There are

no hard and fast rules over this but it appears that summaries that are given after the lesson are better as they help the learner to review the important points in the learned materials (Hartley and Burnhill, 1978).

Summaries also can take the form of flow diagrams. The importance of flow diagrams in learning as in classroom situations lies in the fact that they arrange the salient points of the materials to be learned in several small parts. Furthermore, there is the added advantage of the learned materials being easily produced in a pictoral form in the iconic store of the learner and in these cases learned materials can be recalled easily when the need arises. The use of flow diagrams in our educational system therefore can't be disregarded. During fixations the short - term store rehearses experienced materials in the previous boxes of the flow diagram and in this process most of the learned materials will be retained in the long term store for future recall. This is made possible as flow diagrams compel our eyes to move from one box to another along the arrow's head - which serves two purposes, viz - (a) giving a pause and (b) lifting our eyes by skipping the gap between any two consecutive boxes. The feature as in (a) above gives additional time for more "rehearsals" in the rehearsal buffer of short - term store, thereby helping the long - term store of our brain to process the previously channelled "bits" of information to it by the short - term store. The

feature as in (b) above is in correspondence with the evidence that our eyes move in jerks and not in a continuous manner.

Lastly, the flow-diagrams themselves act as pictures, and hence it acts on the recalling ability of the perceivers from an additional angle, i.e their visual imagery of the iconic store, besides the semantic imagery of their semantic store. As flow diagrams seem the best form of summaries, whether they are before or after the materials to be learned, it is important that we employ this strategy in teaching to enable students learn effectively.

We are perhaps familiar with marginal notes as a kind of summary. The relevant question that comes to our minds is to ask: What type of lessons should teachers prepare for their students, skeletal or elaborate ones? There are no specific answers to the above question as each lesson can be approached differently by teachers. What is important here is that the salient points and concepts in a lesson have to be understood first by students before they are given some tasks on it to perform and it will be quite helpful to students if a teacher who has a lesson on say, reading comprehension of a prose passage summarizes the important points in each paragraph of the passage. These summarized notes facilitate not only students' understanding but also recall of the important points in those paragraphs.

From the above discussion we notice that summaries facilitate future recall of learned materials and that summaries placed at the end of a text aid recall of information more than summeries at ɵther different positions. What lesson can teachers and educators learn here? It is pertinent to state that teachers who spend few minutes at the end of the lesson recapitulating what they have taught never waste students' time at all, instead they help them to review and perhaps retain the important points in the lesson for future recall wherever the need arises.

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APPENDICES

APPENDIX I - TEXT MATERIAL

TEXT FOR TODAY

Ghan's place of influence and power in the Western Sudan was taken over by Mali. A little more is known for certain about the history of Mali than of Ghana. The Kings of Mali were generally staunch moslems who made pilgrimages to Mecca. Records of their visits to the Mediteranean lands have made it possible to date fairly accurately important events in the history of Mali. Fortunately also, the great traveller Ibn Batuta, who visited Mali in the middle of the fourteenth century when the empire was at its zenith, has left a full and most interesting account of events connected with various aspects of life in Mali. Moreover, while the active history of Ghana covers a thousand years, that of Mali covers only about two hundred years of a later period and dominated by most active and sometimes picturesque rulers. However, this is not to say that we know all that we would wish to know about Mali.

The ruling people of Mali were Mandingoes who were closely related to the Soninke of Ghana. The territories that became the centre of the Kingdom of Mali were obscure dependencies of Ghana from the eleventh century or possibly a little earlier.

One of the early kings of Mali called Bermandana was converted to Islam at the time of the Almoravid Movement. He made a pilgrimage to Mecca, and several of his successors followed the practice. The real founder of Mali as Ghana's successor in the Western

Sudan was Sundiata, popularly known under his other name Mari Djata. The name Djata, which means 'a lion', testifies to the courage and masterfulness of Sundiata.

Samanguru, the Susu King who had attacked Kumbi, capital of Ghana, in 1203, later turned his arms on Mali. Success seems not only to have attended his expedition but also to have turned his head, for he is said to have put to death eleven out of twelve Mali royal brothers who fell into his hands. Sundiata, a young cripple, was the only one whose life Sumanguru had spared either out of sympathy or spite. Sumanguru's show of mercy to the cripple, whatever motive lay behind it, was to prove a turning point in the history not only of Mali but of the Western Sudan in general. Sundiata somehow became cured of his deformity. He quickly put himself at the head of a band of hunters with whose support he soon gained control over the Kingdom of Mali. Although at first unpopular, Sundiata eventually won the respect and confidence of his people by embarking upon a career of conquest. First he conquered Wangara and added to his army in the process. Then he attacked the small Kingdom of Labe in Futa Jalon, adding further to his military stength. He then turned eastward, crossed the Niger and defeated Bambara, a tribe of fierce pagans.

By 1234 Sundiata had consolidated his hold over a considerable area and he now returned home to Mali in triumph. Sumanguru naturally viewed with alarm the strong position in which Sundiata now stood and determined to destroy Mali before it was too late. In 1235 Sumanguru made an attack on Mali but was killed by Sundiata at Kirina. The Susu Kingdom was then absorbed into Mali. Everything had steadily been on the ascendant for Sundiata and Mali.

Kumbi had by this time already fallen into obscurity. Its trading inhabitants, mainly Arabs, under their emir or leader, had withdrawn to Walata in 1224. In 1240 Sundiata attacked Kumbi and finally destroyed the former dominant power of the Western Sudan. After this victory Sundiata moved the capital of Mali from Jeriba to Niani. Sundiata never went out on a conquering expedition again.

APPENDIX II

TREATMENTS

GROUP A

- Mali succeeded Ghana.
- The writing of Ibn Ba[illegible]a have full account of the history of Mali.
- Mali lasted for two hundred years.

Ghana's place of influence and power in the Western Sudan was taken over by Mali. A little more is known for certain about history of Mali than of Ghana. The kings of Mali were generally staunch moslems who made pilgrimages to Mecca. Records of their visits to the Mediteranean lands have made it possible to date fairly accurately important events in the history of Mali. Fortunately also, the great traveller Ibn Batuta, who visited Mali in the middle of the fourteenth century when the empire was at its zenith, has left a full and most interesting account of events connected with various aspects of life in Mali. Moreover, while the active history of Ghana covers a thousand years, that of Mali covers only about two hundred years of a later period and dominated by most active and sometimes picturesque rulers.

GROUP A CONTD.

- The ruling people of Mali were the Mandingoes.
- The vassal states of Ghana later came under the control of Mali.

However, this is not to say that we know all that we would wish to know about Mali.

The ruling people of Mali were Maudingoes who were closely related to the Soninke of Ghana. The territories that became the the centre of the Kingdom of Mali were obscure dependencies of Ghana from the eleventh century or possibly a little earlier.

- Many kings of Mali went on pilgrimage to Mecca.
- Sundiata founded Mali.

One of the early kings of called Bermandana was converted to Islam at the time of the Almoravid Movement. He made a pilgrimage to Mecca, and several of his successors followed the practice. The real founder of Mali as Ghana's successor in the Wester Sudan was Sundiata, popularly known under his other name Mari Djata. The name Djata, which means 'a lion', testifies to the courage and masterfulness of Sundiata.

GROUP A CONTD.

- Sumanguru attacked Kumbi and also killed the eleven brothers of Sundiata, the cripple.
- Sundiata became popular and attacked Labe and the Bambara tribe.
- He first conquered Wangara.

Sumanguru, the Susu King who had attacked Kumbi, capital of Ghana, in 1203, later turned his arms on Mali. Success seems not only to have attended his expedition but also to have turned his head, for he is said to have put to death eleven out of twelve Mali royal brothers who fell into his hands. Sundiata, a young cripple, was the only one whose life Sumanguru had spared either out of sympathy or spite. Sumanguru's show of mercy to the cripple, whatever motive lay behind it, was to prove a turning point in the history not only of Mali but of the Western Sudan in general. Sundiata somehow became cured of his deformity. He quickly put himself at the head of a band of hunters with whose support he soon gained control over the Kingdom of Mali. Although at first unpopular, Sundiata eventually won the

GROUP A CONTD.

respect and confidence of his people by embarking upon a career of conquest. First he conquered Wangara and added to his army in the process. Then he attacked the small Kingdom of Labe in Futa Jalon, adding further to his military strength. He then turned eastward, crossed the Niger and defeated Bambara, a tribe of fierce pagans.

- Sundiata killed Sumanguru at Kirina and then absorbed the Susu Kingdom into Mali empire.

By 1234 Sundiata had consolidated his hold over a considerable area and he now returned home to Mali in triumph. Sumanguru naturally viewed with alarm the strong position in which Sundiata now stood and determined to destroy Mali before it was too late. In 1235 Sumanguru made an attack on Mali but was killed by Sundiata at Kirina. The Susu Kingdom was then absorbed into Mali. Everything had steadily been on the ascendant for Sundiata and Mali.

GROUP A CONTD.

- In 1240 Sundiata attacked Kumbi and took control of the remains of Ghana empire.
- Niani became the new capital of Mali under Sundiata.

Kumbi had by this time already fallen into obscurity. Its trading inhabitants, mainly Arabs, under their emir or leader, had withdrawn to Walata in 1224. In 1240 Sundiata attacked Kumbi and finally destroyed the former dominant power of the Western Sudan. After this victory Sundiata moved the capital of Mali from Jeriba to Niani. Sundiata never went out on a conquering expedition again.

GROUP B

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GROUP B CONTD.

- Many Kings of Mali went on pilgrimage to Mecca.
- Sundiata founded Mali.
- Sumanguru attacked Kumbi and also killed the eleven brothers of Sundiata, the cripple.
- Sundiata became popular and attacked Labe and the Bambara tribe.
- He first conquered Wangara.

whose life Sumanguru had spared either out of sympathy or spite. Sumanguru's show of mercy to the cripple, whatever motive lay behind it, was to prove a turning point in the history not only of Mali but of the Western Sudan in general. Sundiata somehow became cured of his deformity. He quickly put himself at the head of a band of hunters with whose support he soon gained control over the Kingdom of Mali. Although at first unpopular, Sundiata eventually won the respect and confidence of his people by embarking upon a career of conquest. First he conquered Wangara and added to his army in the process. Then he attacked the small Kingdom of Labe in Futa Jalon, adding further to his military strength. He then turned eastward, crossed the Niger and defeated Bambara, a tribe of fierce pagans.

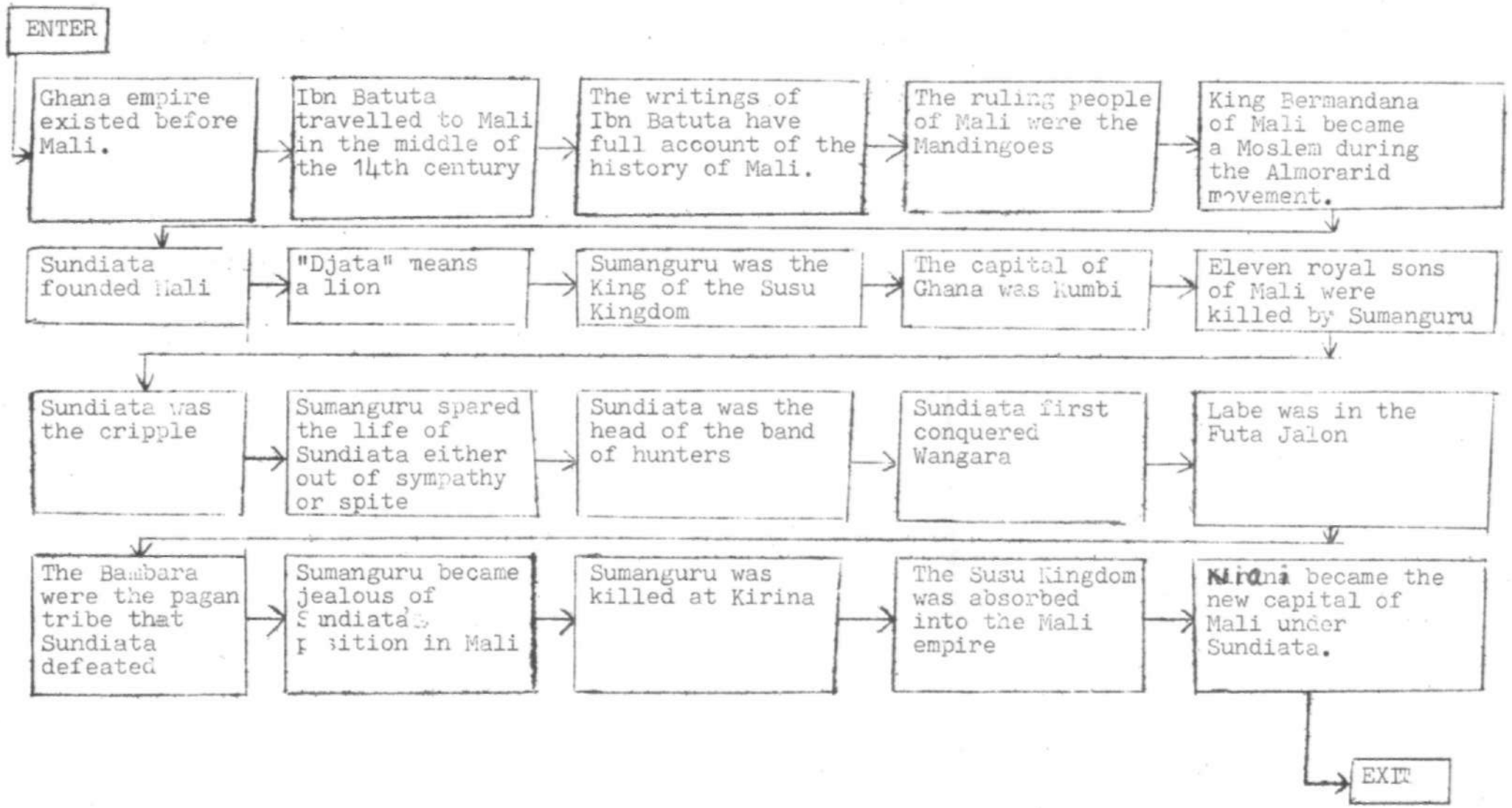
GROUP B CONTD.

- Sundiata killed Sumanguru at Kirina and then absorbed the Susu Kingdom into Mali.
- In 12[illegible] Sundiata attacked Kumbi and took over control of the remains of Ghana empire.
- Niani then became the new capital of Mali.

By 1234 Sundiata had consolidated his hold over a considerable area and he now returned home to Mali in triumph. Sumanguru naturally viewed with alarm the strong position in which Sundiata now stood and determined to destroy Mali before it was too late. In 1235 Sumanguru made an attack on Mali but was killed by Sundiata at Kirina. The Susu Kingdom was then absorbed into Mali. Everything had steadily been ascendant for Sundiata and Mali.

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GROUP C


ENTER
Ghana empire existed before Mali.
Ibn Batuta travelled to Mali in the middle of the 14th century
The writings of Ibn Batuta have full account of the history of Mali.
The ruling people of Mali were the Mandingoes
King Bermandana of Mali became a Moslem during the Almorarid movement.
Sundiata founded Mali
"Djata" means a lion
Sumanguru was the King of the Susu Kingdom
The capital of Ghana was Kumbi
Eleven royal sons of Mali were killed by Sumanguru
Sundiata was the cripple
Sumanguru spared the life of Sundiata either out of sympathy or spite
Sundiata was the head of the band of hunters
Sundiata first conquered Wangara
Labe was in the Futa Jalon
The Bambara were the pagan tribe that Sundiata defeated
Sumanguru became jealous of Sundiata's position in Mali
Sumanguru was killed at Kirina
The Susu Kingdom was absorbed into the Mali empire
Kirina became the new capital of Mali under Sundiata.
EXIT

GROUP C CONTD.

TEXT FOR TODAY

Ghan's place of influence and power in the Western Sudan was taken over by Mali. A little more is known for certain about the history of Mali than of Ghana. The Kings of Mali were generally staunch moslems who made pilgrimages to Mecca. Records of their visits to the Mediterranean lands have made it possible to date fairly accurately important events in the history of Mali. Fortunately also, the great traveller Ibn Batuta, who visited Mali in the middle of the fourteenth century when the empire was at its zenith, has left a full and most interesting account of events connected with various aspects of life in Mali. Moreover, while the active history of Ghana covers a thousand years, that of Mali covers only about two hundred years of a later period and dominated by most active and sometimes picturesque rulers. However, this is not to say that we know all that we would wish to know about Mali.

The ruling people of Mali were Mandingoes who were closely related to the Soninke of Ghana. The territories that became the centre of the Kingdom of Mali were obscure dependencies of Ghana from the eleventh century or possibly a little earlier.

One of the early kings of Mali called Bermandana was converted to Islam at the time of the Almoravid Movement. He made a pilgrimage to Mecca, and several of his successors followed the practice. The real founder of Mali as Ghana's successor in the Western

GROUP C CONTD.

Sudan was Sundiata, popularly known under his other name Mari Djata. The name Djata, which means 'a lion', testifies to the courage and masterfulness of Sundiata.

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GROUP D

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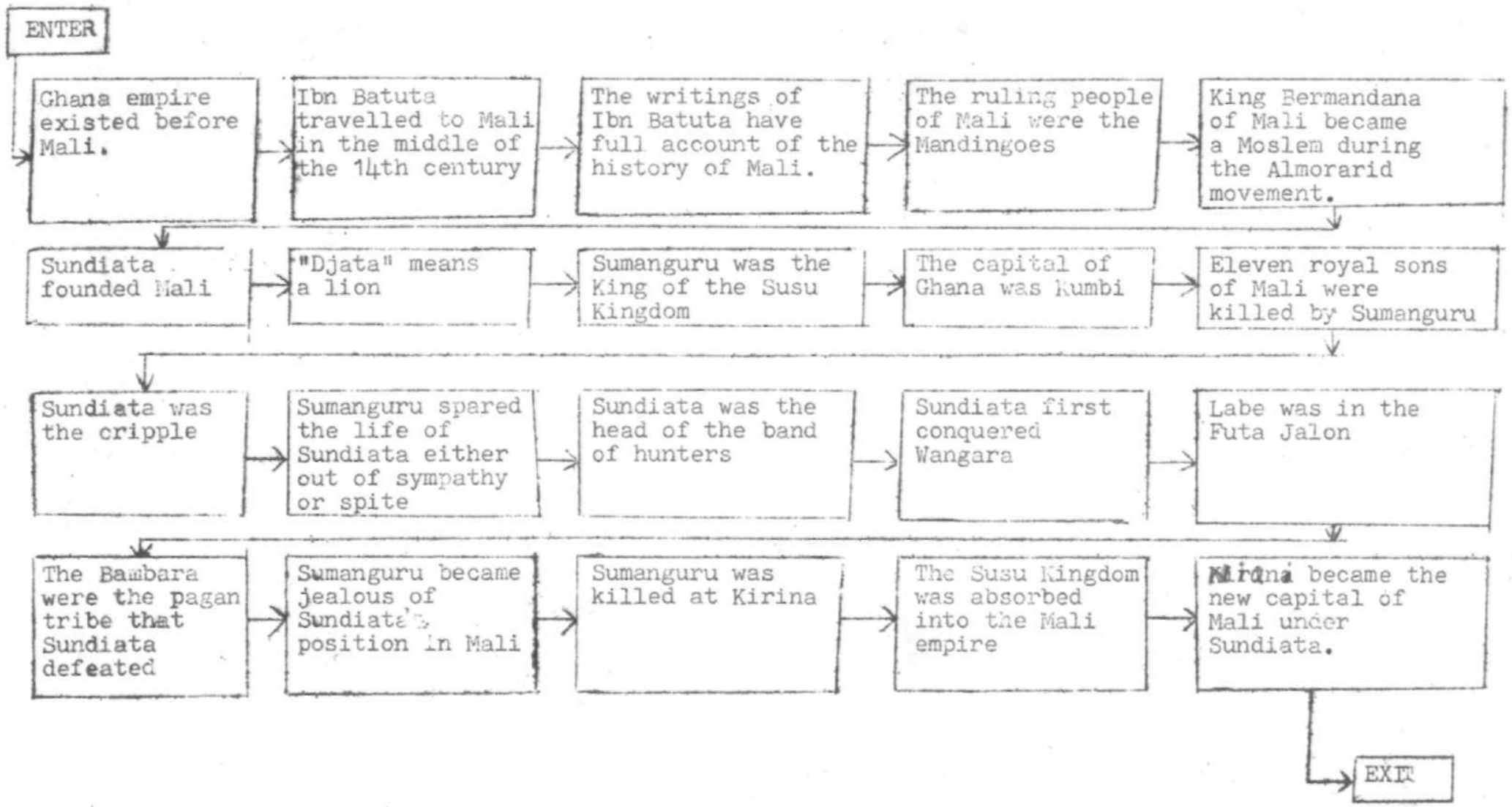
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Kumbi had by this time already fallen into obscurity. Its trading inhabitants, mainly Arabs, under their emir or leader, had withdrawn to Walata in 1224. In 1240 Sundiata attacked Kumbi and finally destroyed the former dominant power of the Western Sudan. After this victory Sundiata moved the capital of Mali from Jeriba to Niani. Sundiata never went out on a conquering expedition again.

GROUP D CONTD.



GROUP E

SUMMARY: Mali came into existence after the collapse of Ghana. Its Kings' records on visits to Mecca and the writings of Ibn Batuta have full account of the history of Mali.

Ghana's place of influence and power in the Western Sudan was taken over by Mali. A little more is known for certain about the history of Mali than of Ghana. The Kings of Mali were generally staunch moslems who made pilgrimages to Mecca. Records of their visits to the Mediteranean lands have made it possible to date fairly accurately important events in the history of Mali. Fortunately also, the great traveller Ibn Batuta, who visited Mali in the middle of the fourteenth century when the empire was at its zenith, has left a full and most interesting accounts of events connected with various aspects of life in Mali. Moreover, while the active history of Ghana covers a thousand years, that of Mali covers only about two hundred years of a later period and dominated by most active and sometimes picturesque rulers. However, this is not to say that we know all that we would wish to know about Mali.

SUMMARY: The ruling people of Mali were the Mandingoes. As time went on the people of Mali incorporated the vassal states of Ghana into Mali.

The ruling people of Mali were Mandingoes who were closely related to the Soninke of Ghana. The territories that became the centre of the Kingdom of Mali were obscure dependencies of Ghana from the eleventh century or possibly a little earlier.

GROUP E CONTD.

SUMMARY: Most of the Kings of Mali were Moslems who performed their religious obligation by going on pilgrimage to Mecca. Sundiata, the cripple is said to be the real founder of Mali empire.

One of the early Kings of Mali called Bermandana was converted to Islam at the time of the Almoravid movement. He made a pilgrimage to Mecca, and several of his successors followed the practice. The real founder of Mali as Ghana's successor in the Western Sudan was Sundiata, popularly known under his other name Mari Djata. The name Djata, which means 'a lion', testifies to the courage and masterfulness of Sundiata.

SUMMARY: As part of his conquest Sumanguru, the King of the Susu Kingdom killed the eleven brothers of Sundiata but spared Sundiata's life as he was a cripple. Sundiata became popular, first conquered Wangara and also attacked Labe in Futa Jalon.

Sumanguru, the Susu King who had attacked Kumbi, capital of Ghana, in 1203, later turned his arms on Mali. Success seems not only to have attended his expedition but also to have turned his head, for he is said to have put to death eleven out of twelve Mali royal brothers who fell into his hands. Sundiata, a young cripple, was the only one whose life Sumanguru had spared either out of sympathy or spite. Sumanguru's show of mercy to the cripple, whatever motive lay behind it, was to prove a turning point in the history not only of Mali but of the Western Sudan in general. Sundiata somehow became cured of his deformity. He quickly put

GROUP E CONTD.

himself at the head of a band of hunters with whose support he soon gained control over the Kingdom of Mali. Although at first unpopular, Sundiata eventually won the respect and confidence of his people by embarking upon a career of conquest. First he conquered Wangara and added to his army in the process. Then he attacked the small Kingdom of Labe in Futa Jalon, adding further to his military strength. He then turned eastward, crossed the Niger and defeated Bambara, a tribe of fierce pagans.

SUMMARY: In the process of expanding his empire Sundiata whose life Sumanguru had spared later attacked and killed Sumanguru at Kirina and absorbed the Susu Kingdom into Mali empire.

By 1234 Sundiata had consolidated his hold over a considerable area and he now returned home to Mali in triumph. Sumanguru naturally viewed with alarm the strong position in which Sundiata now stood and determined to destroy Mali before it was too late. In 1235 Sumanguru made an attack on Mali but was killed by Sundiata at Kirina. The Susu Kingdom was then absorbed into Mali. Everything had steadily been on the ascendant for Sundiata and Mali.

GROUP E CONTD.

SUMMARY: By 1240 Sundiata had captured Kumbi and incorporated the remains of Ghana into Mali empire with its new capital now at Niani.

Kumbi had by this time already fallen into obscurity. Its trading inhabitants, mainly Arabs, under their emir or leader, had withdrawn to Walata in 1224. In 1240 Sundiata attacked Kumbi and finally destroyed the former dominant power of the Western Sudan. After this victory Sundiata moved the capital of Mali from Jeriba to Niani. Sundiata never went out on a conqering expedition again.

GROUP - F

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SUMMARY: Mali came into existence after the collapse of Ghana. Its Kings' records on visits to Mecca and the writings of Ibn Batuta have full account of the history of Mali.

The ruling people of Mali were Maningoes who were closely related to the Soninke of Ghana. The territories that became the centre of the Kingdom of

GROUP F CONTD.

Mali were obscure dependencies of Ghana from the eleventh century or possibly a little earlier.

SUMMARY: The ruling people of Mali were the Mandingoes. As time went on the people of Mali incorporated the vassal states of Ghana into Mali.

One of the early Kings of Mali called Bermandana was converted to Islam at the time of the Almoravid movement. He made a pilgrimage to Mecca, and several of his successors followed the practice. The real founder of Mali as Ghana's successor in the Western Sudan was Sundiata, popularly known under his other name Mari Djata. The name Djata, which means 'a lion', testifies to the courage and masterfulness of Sundiata.

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GROUP F CONTD.

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By 1234 Sundiata had consolidated his hold over a considerable area and he now returned home to Mali in triumph. Sumanguru naturally viewed with alarm the strong position in which Sundiata now stood and determined to destroy Mali before it was too late. In 1235 Sumanguru made an attack on Mali but was killed by Sundiata at Kirina. The Susu Kingdom was then absorbed into Mali. Everything had steadily been on the ascendant for Sundiata and Mali.

SUMMARY: In the process of expanding his empire Sundiata whose life Sumanguru had spared later attacked and killed Sumanguru at Kirina and absorbed the Susu Kingdom into Mali empire.

GROUP F CONTD.

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SUMMARY: By 1240 Sundiata had captured Kumbi and incorporated the remains of Ghana into Mali empire with its new capital now at Niani.

APPENDIX III: RETENTION TEST.

QUESTIONNAIRE

INSTRUCTION: ANSWER ALL QUESTIONS.

SEX: MALE..... FEMALE .....

AGE:.....

1. Who was the cripple?.....
.....

2. Which city became the new capital of Mali under Sundiata?.....

3. Who headed the band of hunters?.....
.....

4. The name "Djata" means what?.....
.....

5. Where was Sumanguru killed?.....
.....

6. What empire existed before Mali?.....
.....

7. Who were the ruling people of Mali?.....
.....

8. What was the capital of Ghana?.....
.....

9. Whose writings have full acount of the history of Mali? .....

10. Which place did Sundiata first conquer?
.....

11. Into which empire was the Susu Kingdom absorbed?
.....

12. What one reason made Sumanguru spare the life of Sundiata? .....

13. Which pagan tribe did Sundiata defeat?

.....

14. Who travelled to Mali by the Middle of the 14th century? .....

15. Who is the founder of Mali? .....

.. ..

16. Who was the King of the Susu? .....

.....

17. Where was the small Kingdom of Labe located?

.....

18. How many royal sons of Mali were killed by Sumanguru? .....

19. Who became jealous of Sundiata's position in Mali? .....

20. Which King of Mali became a Moslem during the Almoravid Movement?.....

.....

APPENDIX IV

INSTRUCTION SHEET

Post-Graduate School,
Faculty of Education,
Ahmadu Bello University,
Zaria.

10th December, 1983.

Dear Student,

The questions that you will answer below are not for intelligence test nor any other examination. However, they relate to the comprehension text you have just read.

Your name is not required on the questionnaire but you must state your sex and age on the space provided.

Please note too that your answers will be strictly treated on confidential basis.

Yours sincerely,

E. Y. Avong,
(Post-Graduate Student).

APPENDIX V

DATA MATRIX

GROUP A: MARGINAL NOTES FOR EVERY PARAGRAPH

SUBJECTS	SEX: M = 1 F = 2	AGE IN YEARS	RETENTION SCORE I	RETENTION SCORE II
1	1	19	9	9
2	1	17	10	10
3	1	15	19	17
4	1	18	9	9
5	1	17	5	5
6	1	18	9	9
7	1	15	13	13
8	1	16	12	10
9	1	16	13	13
10	1	16	5	5
11	1	18	15	15
12	1	18	3	3
13	1	19	17	17
14	1	18	13	13
15	1	22	12	10
16	1	17	11	9
17	1	17	15	13
18	1	17	10	10
19	1	19	13	13
20	1	19	12	10
21	1	18	20	20

GROUP A CONTD.

SUBJECTS	SEX: M = 1 F = 2	AGE IN YEARS	RETENTION SCORE I	RETENTION SCORE II
22	1	18	11	11
23	1	18	5	3
24	1	17	20	18
25	1	19	10	8
26	1	20	6	4
27	1	18	6	6
28	1	16	13	13
29	1	20	7	7
30	1	17	18	18
31	1	19	11	9
32	1	17	12	10
33	1	18	12	10
34	1	17	9	7
35	1	15	13	11
36	1	16	10	8
37	1	19	12	10
38	1	15	12	10
39	1	18	11	9

DATA MATRIX

GROUP B: MARGINAL NOTES FOR EVERY TWO PARAGRAPHS

SUBJECTS	SEX M = 1 F = 2	AGE IN YEARS	RETENTION SCORE I	RETENTION SCORE II
1	1	17	11	11
2	1	18	4	4
3	1	17	13	11
4	1	18	15	13
5	1	17	17	17
6	1	20	7	7
7	1	18	8	6
8	1	22	1	1
9	1	20	11	11
10	1	19	10	4
11	1	15	1	1
12	1	16	9	9
13	1	19	13	13
14	1	19	7	7
15	1	18	15	13
16	1	19	7	7
17	1	18	4	2
18	1	17	11	11
19	1	19	14	12
20	1	20	18	18
21	1	20	4	2
22	1	20	13	13

GROUP B CONTD.

SUBJECTS	SEX M = 1 F = 2	AGE IN YEARS	RETENTION SCORE I	RETENTION SCORE II
23	1	18	10	8
24	1	19	12	12
25	1	18	17	15
26	1	20	14	12
27	1	16	17	15
28	1	18	10	10
29	1	16	15	13
30	1	18	16	14
31	1	18	3	1
32	1	20	12	12
33	1	16	7	7
34	1	18	13	11
35	1	19	15	13
36	1	17	6	6
37	1	17	16	16
38	1	20	10	8
39	1	16	17	15
40	1	22	6	4

DATA MATRIX

GROUP C: FLOW DIAGRAMS BEFORE TEXT

SUBJECTS	SEX M = 1 F = 2	AGE IN YEARS	RETENTION SCORE I	RETENTION SCORE II
1	1	16	15	15
2	1	16	3	3
3	1	20	11	9
4	1	18	17	15
5	1	18	8	6
6	1	16	18	18
7	1	19	6	6
8	1	21	17	17
9	1	19	6	4
10	1	17	17	17
11	1	22	16	14
12	1	16	17	17
13	1	17	19	17
14	1	18	18	18
15	1	18	12	12
16	1	16	8	6
17	1	20	15	15
18	1	18	16	14
19	1	18	19	17
20	1	19	16	14
21	1	15	12	10
22	1	20	12	10

GROUP C CONTD.

SUBJECTS	SEX M = 1 F = 2	AGE IN YEARS	RETENTION SCORE I	RETENTION SCORE II
23	1	20	17	17
24	1	19	14	12
25	1	16	19	19
26	1	15	18	18
27	1	18	18	16
28	1	21	18	18
29	1	18	20	20
30	1	16	20	18
31	1	18	14	12
32	1	16	19	17
33	1	17	14	12
34	1	18	15	15
35	1	18	11	9
36	1	16	12	12
37	1	18	13	11
38	1	20	4	4
39	1	16	10	10

DATA MATRIX

GROUP D: FLOW DIAGRAMS AFTER TEXT.

SUBJECTS	SEX M = 1 F = 2	AGE IN YEARS	RETENTION SCORE I	RETENTION SCORE II
1	1	19	18	18
2	1	17	10	8
3	1	20	19	19
4	1	16	9	9
5	1	19	15	13
6	1	20	10	10
7	1	16	13	11
8	1	19	17	15
9	1	20	11	11
10	1	17	12	12
11	1	16	18	18
12	1	18	10	10
13	1	16	16	14
14	1	19	14	12
15	1	23	9	7
16	1	16	18	18
17	1	18	15	15
18	1	15	17	15
19	1	16	19	19
20	1	19	16	14
21	1	17	20	18
22	1	16	18	18

GROUP D CONTD.

SUBJECTS	SEX M = 1 F = 2	AGE IN YEARS	RETENTION SCORE I	RETENTION SCORE II
23	1	18	20	20
24	1	16	11	11
25	1	21	12	10
26	1	18	6	6
27	1	16	19	17
28	1	16	15	15
29	1	18	18	16
30	1	17	9	7
31	1	20	20	18
32	1	22	10	10
33	1	21	15	15
34	1	17	18	16
35	1	17	20	18
36	1	19	5	3
37	1	23	11	11
38	1	15	19	19
39	1	16	13	11
40	1	22	16	16

DATA MATRIX

GROUP E: SUMMARY BEFORE EVERY PARAGRAPH

SUBJECTS	SEX M = 1 F = 2	AGE IN YEARS	RETENTION SCORE I	RETENTION SCORE II
1	1	16	8	8
2	1	18	12	12
3	1	20	17	15
4	1	17	15	13
5	1	18	11	9
6	1	19	16	16
7	1	23	6	6
8	1	20	14	12
9	1	17	10	8
10	1	20	4	2
11	1	22	13	11
12	1	16	0	0
13	1	19	3	3
14	1	19	8	8
15	1	15	12	10
16	1	15	10	10
17	1	20	6	4
18	1	16	1	1
19	1	17	3	1
20	1	19	18	18
21	1	21	14	12
22	1	19	9	9

GROUP E CONTD.

SUBJECTS	SEX M = 1 F = 2	AGE IN YEARS	RETENTION SCORE I	RETENTION SCORE II
23	1	17	13	11
24	1	19	3	3
25	1	16	16	14
26	1	21	10	10
27	1	17	2	0
28	1	17	13	13
29	1	20	13	11
30	1	18	11	9
31	1	15	9	9
32	1	16	17	15
33	1	20	15	15
34	1	19	10	8
35	1	17	17	15
36	1	19	1	1
37	1	17	10	8
38	1	18	7	7

DATA MATRIX

GROUP F: SUMMARY AFTER EVERY PARAGRAPH

SUBJECTS	SEX M = 1 F = 2	AGE IN YEARS	RETENTION SCORE I	RETENTION SCORL II
1	1	20	12	12
2	1	17	10	8
3	1	18	3	1
4	1	20	5	5
5	1	21	0	0
6	1	16	14	12
7	1	16	16	14
8	1	17	10	8
9	1	17	18	16
10	1	17	16	16
11	1	23	18	16
12	1	18	13	11
13	1	19	13	11
14	1	21	7	7
15	1	21	5	5
16	1	20	9	7
17	1	16	9	9
18	1	18	1	1
19	1	19	18	16
20	1	22	3	1
21	1	17	5	5
22	1	19	9	9

GROUP F CONTD.

SUBJECTS	SEX M = 1 F = 2	AGE IN YEARS	RETENTION SCORE I	RETENTION SCORE II
23	1	23	10	8
24	1	18	6	4
25	1	18	10	10
26	1	16	13	13
27	1	19	11	9
28	1	16	9	9
29	1	20	5	5
30	1	18	16	14
31	1	19	19	19
32	1	21	15	13
33	1	15	15	13
34	1	20	10	8
35	1	15	11	11
36	1	16	13	11
37	1	18	8	6
38	1	16	14	14

DATA MATRIX

GROUP G: CONTROL

SUBJECTS	SEX M = 1 F = 2	AGE IN YEARS	RETENTION SCORE I	RETENTION SCORE II
1	1	17	5	5
2	1	16	4	4
3	1	18	3	3
4	1	18	6	4
5	1	17	2	0
6	1	14	0	•
7	1	19	12	12
8	1	17	0	0
9	1	16	7	5
10	1	18	3	3
11	1	16	4	2
12	1	16	5	3
13	1	17	3	3
14	1	15	8	8
15	1	20	6	4
16	1	19	0	0
17	1	16	5	5
18	1	16	3	1
19	1	17	4	2
20	1	15	7	7
21	1	18	4	2
22	1	19	5	5

GROUP G CONTD.

SUBJECTS	SEX M = 1 F = 2	AGE IN YEARS	RETENTION SCORE I	RETENTION SCORE II
23	1	16	10	10
24	1	19	7	5
25	1	19	0	0
26	1	16	.1	1
27	1	17	12	10
28	1	18	9	9
29	1	20	8	6
30	1	17	3	3
31	1	21	6	4
32	1	18	2	0
33	1	18	5	3
34	1	15	1	0
35	1	20	5	5
36	1	19	9	7
37	1	19	7	5
38	1	21	10	8
39	1	17	4	4
40	1	20	3	1