Chapter I
Introduction

Over the past century, there has been an ever growing body of experimental data which has slowly led to the emergence of a solid body of factual knowledge concerning the conditions which influence the speed and efficiency of learning. Efficiency depends on a number of factors such as the nature and extent of the material being learnt, the abilities of the learner and the method of practice.

Although a number of investigations have provided evidence to prove the effectiveness of a particular method over another, it appears that a fixed amount of time is necessary for learning a fixed amount of material regardless of the method of practice. In some methods the extent of the material being learned at moment is manipulated (part and whole method) and in others the time variable is controlled (Massed and spaced learning).

Methods of learning:

Massed vs Spaced method of practice: Many lessons are too long to be mastered only in a single sitting so the problem arises whether trials should be given without any intermission or whether sometime should elapse between the subsequent trials. In the massed method, the material is memorized in one sitting without any intervals while in the spaced method, the material is not memorized in one single sitting rather rest intervals are introduced in between.
A number of investigations have been conducted to assess the economy of these two methods. However, there is no consensus on the effectiveness of any one of the methods. A number of other factors such as nature of material, length of rest pauses etc. also affect the degree of recall.

It has been found that animals require fewer trials to establish a habit if the trials are separated by an interval of time rather than if they follow one another immediately. Similarly fewer massed trials are required when meaningless material is being learned (Ebbinghaus, 1885), while the spaced method is more economical for meaningful material (Pierson 1913; Perkins 1914; English, Welborn and Killian 1934).

Short lessons need lesser time if the massed method is used. Lyon (1917) reported that subjects look lesser time to memorise a list of 12 digits in continuous reading than in one reading per day. With longer lesson this advantage shifted to one trial daily. Similar results were obtained from animal studies. Rats required lesser massed trials to learn a short maze than widely spaced trials, but a longer maze was learned better by spaced trials. However, the exact amount of time that should separate the trials for most economical learning has not been definitely determined. It probably varies from situation to situation.
For a particular task, there is usually an optimal combination of practice periods and rest intervals which result in maximum learning efficiency. Generally, short practice periods followed by short rest periods are found to be most effective and practical. Longer periods of practice require longer rest periods so that the optimal speed of learning and performance can be maintained. However, increasing the rest interval beyond a certain optimal level has no further facilitative effect. Thus, rest periods should not be so long as to lead to serious amount of forgetting between successive practice periods, but should be long enough to allow the accumulated fatigue to decipate.

In certain situations spaced practice is beneficial even when fatigue is not an adverse factor. In these situations learning is adversely affected by development of conflicting connections. These conflicts appear to subside rapidly during the rest periods such that the positive effect of repetition can be observed on the subsequent trial. Other than duration even the stage at which the rest interval is given affects the efficiency. For certain activities massing of practice in early stage followed by spaced practice is better while for others the inverse is more optimal.

Thus, it appears that spaced practice is more advantageous for meaningful material while the massed is better for stereotyped, low meaningful material. This difference
could be due to the fact that a higher degree of interest can be maintained in material which is meaningful and significant for the learner. Prolonged practice would result in reduced interest and thereby reduce the efficiency. Also wrong associations which are weaker than the right ones are readily forgotten during the rest period. Following the rest pause the learner can return to his task with increased vigour and interest.

However, in case of stereotyped, repetitive work, rest pauses might result in loss of warm-up. After a long rest pause, some time would be lost in reaching the previously level of performance.

Thus, it appears that for longer and difficult task's the spaced method of practice would be more effective, while for short repetitive tasks the massed method is more economical.

Whole vs Part method of Practice:

A task may be learned all at once, or part by part. A rat may be given a part of the maze to learn at one time and then another part, or it may be given the whole maze to learn at once. Similarly, a human subject may learn a poem stanza by stanza or he may read it from the beginning to end in each trial.
In learning a given material it might be better to try to learn it by going over the complete material or by breaking it into small portions and learning each in turn. The former is called the whole method and the later the part.

A great deal of experimental work has been devoted to an evaluation of whole vs part method of practice and the results have not always been free from contradiction. Superior efficiency has been claimed for each of the methods.

Crafts (1929) reported that the whole method was somehow more economical than the part. Beeby (1930) in his experiment on two hand coordination, observed that this method was superior. McGeoch (1931 a) concluded on the basis of her experiments with average and bright children that the whole method was unfamiliar to the children. However, Brown (1924) Davis and Meens (1932) and Hanawalt (1934) found the whole method to be more superior.

Both these methods were compared at a practical level by Haskeins (1936). His material consisted of speeches on political and economic problems, combined into lessons of 1,500 to 15,000 words. Each lesson was studied by two groups, one group reading each paragraph three items before passing to the next, the other group reading the whole lesson through three items.
In a second round, with comparable lessons, the whole and part groups were interchanged. The number of reading, but not the study time, was controlled. A few hours after the study period, and again two weeks later, a test was given with true-false and multiple-choice items on the facts and a written statement of O's understanding of the arguments. Analysis of the data revealed no consistent advantage for either the whole or part method.

Similarly Cook (1936, 1937) conducted an experiment on human S's with mazes of different lengths. He found that there was no advantage of either whole or part learning. Thus it appears that the effectiveness of a particular method can scarcely be predicted. Since, the whole is more meaningful than the part, each part has its place in the structure of the whole, but may make little sense when isolated. While on the other hand, the whole must be read several times before the learner makes any apparent progress. Also to learn the whole is a distant goal, while the parts can be mastered quickly. Thus, though meaning and organisation favour the whole method, the principal of reinforcement favours the part method. However, a number of investigators have reported that the total amount of time required to learn a fixed amount of material remains the same irrespective of the method of practice (Lovland 1938 a, 1938 b, Kelton and Stone 1942).
Thus if it takes 10 seconds to learn each of the items of a given list, the Total-Time Hypothesis would predict that a subject could reach criterion in either one 20.5 second-per-item trials or 10 1 second per-item trials or 5 2 second-per-item trials or 1 10 second-per-item trial.

Thus it appears that a fixed amount of time is necessary to learn a fixed amount of material regardless of the number of individual trials into which the time is divided.

This hypothesis has received support from a number of investigations in which paired-associate or free recall learning was used (Murdock, 1960; Peters, 1936; Bousfield, Sedgewick and Cohen, 1954). However, the evidence from serial learning studies is less impressive (Keppel and Rehula, 1965; Melton and Stone, 1942; Hovland, 1938 a, 1938 b). Conflicting results concerning the tenability of this hypothesis when low meaningful material is used (Muhar and Shrivastava, 1971; Bhaskar and Muhar, 1972).

The reason for those contradictory results might be that the time potentially available to the subject for repeated response evocation might not bear a positive linear relationship to the nominal time, i.e. the clock time. Since in the above mentioned investigations, the nominal time and not the effective time was manipulated,
those results could be due to the variance between the effective time. Another reason for the invariance shown in total learning time in these studies might be that tasks such as serial learning require more active operation to sequentially process items already in memory storage (Cooper and Pantee, 1967). Thus it appears that the total time hypothesis holds only when the task requirements do not exceed simple rehearsal and the effective time bears a linear relationship to nominal time.

We may now pass on to the next chapter dealing with the review of the pertinent literature.