CHAPTER - III
RESEARCH METHODOLOGY
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3.0 GENERAL

Research is a systematic observation conducted to test various problems, theories and concepts, and to find a solution based on the collected evidences. So any research should have a proper method and framework within which the proceedings of the research should be conducted. There are various methods and procedures for conducting a research, but all the methods cannot be accepted and the selection should be made with proper care to suit the problem that has been selected. The research that adopted here is applied research, which tests the theories developed through fundamental research, based on datas collected during field experiments and analysing it by using methodologies followed in the field of psycholinguistics. The design of method in which this research is conducted is explained in this chapter through the following six levels:

(i) Research problem.
(ii) Formation of the data, to test the problem.
(iii) The Universe to which the test has been administered.
(iv) The method of administering and collecting the data.
(v) The process of analysis.
(vi) Discussion of results.

3.1 The Research Problem

Any investigation starts with the identification of the problem and aims to give proper solution to it, and the problems
that has been undertaken in this work are the following:

3.1.1 Problem 1: The process of Understanding

Understanding is a cognitive process which processes information from the linguistic elements. Various tests were conducted to find out when a message is given, how the information is processed from the given message; the factors that affect the process of understanding and the differences in the understanding levels of various items. Since comprehension is an internal process of which inferences can only be made through external observation of the performances, various comprehension tasks were given to the informants and observations are made based on the scores of the tasks.

3.1.2 Problem 2: The process of recall

Some of the tests that had been administered to test the understanding level were used to test the process of recall. The linguistic elements and the messages were asked to be recalled immediately after the completion of the test conducted to test the process of understanding and again after a gap of half-an-hour. The main aim is to find out the process of recall, the factors that affect the process of recall, differences in the recalling ability of various items and to gauge the difference between the recalled linguistic elements and message recalled immediately and recognized after a gap of half-an-hour. The tests that were conducted in the first phase is termed as immediate recall and the next phase of recall, which was conducted after half-an-hour is termed as delayed recall / recognition task.
Like comprehension tasks, recall task is also based on the external observations made on the recalled material, to study the nature of the stored linguistic units and materials.

3.1.3. Problem 3: The correlation between the level of understanding and level of recall

The linguistic elements and messages that were given to the informants for testing the levels of understanding and levels of recall were the same. The output in the form of recall is studied to find out the relation between the input and output. So the main aim is to find out whether there is any connection between the levels of understanding and levels of recall, based on the assumption that the recalling level will be high or low depending on the understanding level. The correlation between the level of understanding and recall is of great importance since the present research on the memory system is focused on the information processing, both the initial comprehension of the messages and its later retrieval process.

3.1.4. The Individual Views

Eventhough the same test was administered to all, the informants are found to differ from each other greatly in the way they answered the test questions. So the individuals attitude are correlated with the levels of understanding and recall to test the effects of individuals attitude on them.

3.2 The Formation of the Data:

Datas form the base of any field research, so the structure and the composition of the data should be formulated in
such a way, that it tests the problems and helps to find out proper solutions.

3.2.1 Structure of the Data

3.2.1.1 Conditional Test: The tests conducted to elicit data was a conditional test, the testing matters were prepared mainly based on the test of English as Foreign Language (TOEFL) pattern, set for written comprehension and the questions were asked based on the prepared material, to test the understanding and recalling process.

3.2.1.2 Off-line Experiment

The psycholinguistics research on language comprehension is conducted using either the online or Off-line experimental techniques. The click-study serves as an example of On-line experiment, but the technique adopted here, is the off-line experimental technique, the tests were conducted and executed after the linguistic elements and messages were read.

3.2.1.3 Classification of Procedures

The procedures are classified based on the measure of performance and measures of response.

3.2.1.3.1 Measures of Performance

The measure of performance tests the ability of the test taker. The test that had been conducted in this research is to test the understanding level and level of recall, through the process of analysing the answers. The measures of performance reflects the linguistic ability, the differences in the levels of understanding and recall which demands different cognitive
3.2.1.3.2 Measure of Response

The measure of response are a kind a self-report, which will bring out vividly the feelings and attitudes of the informants. In this experiment to test the individual variations this kind of measures of response had been used, the feelings and attitudes of the informants towards the test were collected based on the questions, answered by the informants using selectional procedure.

3.2.1.4 Classification of differences

3.2.1.4.1. Difference between Item

Each and every task which tests various process of understanding and recall consists of different items. The difference in the understanding level and recall level of these items are measured and correlated with the variables. The different items and their variables, are ranked either high or low depending on the total mean score of the items.

3.2.1.4.2. Difference between tasks in a unit

Every unit consisted of one or more tasks, if the tasks are more than one in a unit, the understanding and recalling level of the different tasks in a unit are gauged, to find out which cognitive process is used better by the informants.

3.2.1.4.3. Difference between Linguistic Elements
The testing material consisted of two linguistic elements namely words and sentences. The difference between the level of understanding and level of recall were tested in both the linguistic elements to find out which linguistic elements is understood highly by the informants.

3.2.1.4.4. Difference between Understanding and recall

The difference between the level of understanding and level of recall is gauged to find out which cognitive activity is involved better, whether understanding or recall in different linguistic elements.

3.2.1.4.5. Classification of Individual differences

Based on the measures of typical response the informants are classified according to their attitudes and the attitudes are correlated with the levels of understanding and recall to check whether the differences in attitude has any repurcussions on them.

3.2.1.5. The Variables

The variables are the objects which can be measured, manipulated and observed during the process of collecting information from the informants through the formation of questionnaire. The variables are selected depending on the research problem, the design of experiment and practical considerations. The variables selected in this research are of two types. They are:

3.2.1.5.1. Dependent Variable

Dependent variables are those variables which depend on
other variables. In this study the dependent variables are the understanding level and level of recall. As already stated in problem 1 (3.1.1) and problem 2 (3.1.2) the levels of understanding and recall are affected by various factors, and the various factors are the independent variables which bring out the differences in the levels of understanding and recall.

3.2.1.5.2. Independent Variables

Independent variables are those variables which have an effect on the dependent variable and based on this, predictions are made on the dependent variable. Correlations are made between the dependent and independent variable to test the effect on each other. Some of the independent variables that are adopted in this research are:-

(1) Level of difficulty:

Level of difficulty is measured based on the easy or difficulty level of the test items.

(2) Level of prediction-accuracy:

Level of prediction-accuracy is based on the certainty or uncertainty of the answers.

(3) Level of frequency:

Level of frequency depends on the number of times the test items were read by the informants.

(4) Level of Checking:

It denotes the number of times the target word or sentences were read for the completion of the cognitive processes.
(5) Reaction-Time:

For all the tasks that were conducted in this experiment the reaction time is taken as the primary measure of processing complexity, it denotes the time which the informant took to answer the questions.

3.2.2. The Composition of Data

3.2.2.1. The testing Elements

The testing elements were drawn from the two levels of language.

They are:

(i) Word level:

The testing matters at the word level were of three types, they are:

(a) Word in Isolation;
(b) Word in a System;
(c) Word in a Sequence.

(ii) Sentence Level:

The sentence level study is composed of three units and. They are:

(a) Parts of the sentences;
(b) Sentences;
(c) Paragraphs;

3.3 The nature of the Universe

The final year Undergraduate students of the Bharathiar University, Coimbatore (India)were taken as informants for the
<table>
<thead>
<tr>
<th>Linguistic Elements</th>
<th>Testing Elements</th>
<th>Testing matters</th>
<th>No of Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>word in isolation</td>
<td>word in isolation</td>
<td>Task 1,8,9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>word association</td>
<td>Task 2</td>
</tr>
<tr>
<td>Word Level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Word in System</td>
<td>Word relation</td>
<td>Task 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Analogy</td>
<td>Task 4,10,11</td>
</tr>
<tr>
<td></td>
<td>Word in Context</td>
<td>Word in context</td>
<td>Task 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Polysemus words</td>
<td>Task 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Antonyms</td>
<td>Task 7,12,13</td>
</tr>
<tr>
<td>Sentence Level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Part of Sentences</td>
<td>Phrases</td>
<td>Task 14,21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sentences</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>with errors</td>
<td>Task 15</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Individual Sentences</td>
<td>Task 16,23</td>
</tr>
<tr>
<td></td>
<td></td>
<td>idea units</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reading Comprehension</td>
<td>Task 17</td>
</tr>
<tr>
<td></td>
<td></td>
<td>with semantic implications</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Usage of inferences</td>
<td>Task 18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jumbled Sentences</td>
<td>Task 19,24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reading Comprehension</td>
<td>Task 20,25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>passage</td>
<td>26</td>
</tr>
</tbody>
</table>
study whose medium of instructions throughout their educational career had been English. Random sampling method was adopted and fifty students were selected as informants. and the students belonged to different subject background like Mathematics, Commerce, Zoology, History, Economics and so on. The informants were selected from various background because the influence of a particular subject should not be seen. The students were allowed to take up the test only after they expressed their willingness to answer the questionnaire.

3.4. Experimental Design

'Within Group' experimental design is followed in this research and no group variances are seen if within group experiment is conducted. The importance is given to the understanding and recalling level of all the informants of the various linguistic elements and the differences in the understanding and recalling level of informants were tested and the 'between group' design is followed only to correlate the individuals attitude and the performance task.

3.5 The method of administering and collecting of data

3.5.1. Method of administering data

Students were taken in a small group and the test was administered. The students were given information about the purpose of the test, nature of the test and how to answer the test. Before they answered each and every item, some samples were given and nature of that particular task was explained. Any doubts which arised when the example was administered, were
cleared and only after this process the students were permitted to take the test. Subjects were allowed to take as much as time as to understand and recall the elements and message. It took nearly eight to ten hours for administering the questionnaire to the informant and eliciting the acquired data from the informants.

3.5.2. The method of data Collection

The underlying mental operation can be studied through any kind of linguistic activity, namely, reading, writing, speaking and listening. This study focusses its attention on the linguistic activity of reading and writing; the linguistic elements and the messages were read and questions were answered through the written mode. Since the aim is to test the trait of understanding and recalling process, and various testing methods were administered to the informants in the form of questions to measure and gauge the understanding and recalling level.

3.2.1. Data for testing dependent variables

Data for testing the dependent variables are concerned with the responses to various test items, which directly leads to the quantification of the levels of understanding and recall. The various tasks that were administered to the informants are presented in table 3.2 and the mode of testing are presented below:

3.5.2.1.1. Data for testing the process of understanding

(i) Free-answer tests

The free answer tests were composed of items based on
questions to test the informants knowledge to organize the answers. The mode of testing relies on the capacity of the informants to give the correct answer because there were no clue present in the form of distractors. Word in isolation (task-1) and word-association test (task-2) were of this type.

(ii) Restatement

Sentences with errors were asked to be read and the gathered information had to be restated in the informants own words. Again like the free-answer test there were no clues in the form of distractors. Sentence with errors (task 15) in the sentence level question type falls under this pattern.

(iii) Objective type

The basic operation involved in this type of test

<table>
<thead>
<tr>
<th>Tasks</th>
<th>nature of the Task</th>
<th>Experiment</th>
<th>No. of items</th>
<th>No. Of observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task-1</td>
<td>Comprehension Task</td>
<td>Experiment-1</td>
<td>10</td>
<td>500</td>
</tr>
<tr>
<td>Task-2</td>
<td>Comprehension Task</td>
<td>Experiment-2</td>
<td>5</td>
<td>250</td>
</tr>
<tr>
<td>Task-3</td>
<td>Comprehension Task</td>
<td>Experiment-3</td>
<td>5</td>
<td>250</td>
</tr>
<tr>
<td>Task-4</td>
<td>Comprehension Task</td>
<td>Experiment-4</td>
<td>10</td>
<td>500</td>
</tr>
<tr>
<td>Task-5</td>
<td>Comprehension Task</td>
<td>Experiment-5</td>
<td>10</td>
<td>500</td>
</tr>
<tr>
<td>Task-6</td>
<td>Comprehension Task</td>
<td>Experiment-6</td>
<td>6</td>
<td>300</td>
</tr>
<tr>
<td>Task-7</td>
<td>Comprehension Task</td>
<td>Experiment-7</td>
<td>5</td>
<td>250</td>
</tr>
<tr>
<td>Task-8</td>
<td>Recall task</td>
<td>Experiment-8</td>
<td>10</td>
<td>500</td>
</tr>
<tr>
<td>Task-9</td>
<td>Recognition Task</td>
<td>Experiment-8</td>
<td>5</td>
<td>250</td>
</tr>
<tr>
<td>Task-10</td>
<td>Recall Task</td>
<td>Experiment-9</td>
<td>5</td>
<td>250</td>
</tr>
<tr>
<td>Task-11</td>
<td>Recognition task</td>
<td>Experiment-9</td>
<td>10</td>
<td>500</td>
</tr>
<tr>
<td>Task-12</td>
<td>Recall Task</td>
<td>Experiment-10</td>
<td>5</td>
<td>250</td>
</tr>
<tr>
<td>Task-13</td>
<td>Recognition Task</td>
<td>Experiment-10</td>
<td>5</td>
<td>250</td>
</tr>
<tr>
<td>Task-14</td>
<td>Comprehension Task</td>
<td>Experiment-11</td>
<td>5</td>
<td>250</td>
</tr>
<tr>
<td>Task-15</td>
<td>Comprehension Task</td>
<td>Experiment-12</td>
<td>10</td>
<td>500</td>
</tr>
<tr>
<td>Task-16</td>
<td>Comprehension Task</td>
<td>Experiment-13</td>
<td>5</td>
<td>250</td>
</tr>
<tr>
<td>Task-17</td>
<td>Comprehension Task</td>
<td>Experiment-14</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Task-18</td>
<td>Comprehension Task</td>
<td>Experiment-15</td>
<td>4</td>
<td>200</td>
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<tr>
<td>Task-19</td>
<td>Comprehension Task</td>
<td>Experiment-16</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Task-20</td>
<td>Comprehension Task</td>
<td>Experiment-17</td>
<td>5</td>
<td>250</td>
</tr>
<tr>
<td>Task-21</td>
<td>Recall Task</td>
<td>Experiment-18</td>
<td>5</td>
<td>250</td>
</tr>
<tr>
<td>Task-22</td>
<td>Recognition Task</td>
<td>Experiment-18</td>
<td>5</td>
<td>250</td>
</tr>
<tr>
<td>Task-23</td>
<td>Recall Task</td>
<td>Experiment-19</td>
<td>5</td>
<td>250</td>
</tr>
<tr>
<td>Task-24</td>
<td>Recall Task</td>
<td>Experiment-20</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>Task-25</td>
<td>Recall Task</td>
<td>Experiment-21</td>
<td>16segment800</td>
<td>500</td>
</tr>
<tr>
<td>Task-26</td>
<td>Delayed recall Task</td>
<td>Experiment-21</td>
<td>16segment800</td>
<td>500</td>
</tr>
</tbody>
</table>

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was the process of ticking, which had to be made after the examples and non-examples, the right and the wrong answers were identified, from the four distractors which had the right answer presented in all the test items. In anology (Task-4) and in choosing the answer that is closest in meaning while understanding the individual sentences with idea units, (Task-16) the examples and non-examples were asked to be identified and in understanding word in Context (Task-5). In answering sentence completion questions during the process of understanding antonyms and phrases (Task 7 & 14), in reading comprehension (Task 17 & 20) the correct answers were asked to be ticked out of the distractors.

(iv) Find the Odd one Out

This mode of testing was used only in word relation test (Task-4) where one element stood apart conceptually from other elements, identification of that element had to be made and underlined.

(v) Pick up the right word

While testing the understanding level of polysemus words (Table-6) the words in the jumbled order had to be matched against each sentences depicting the various polysemus words.

(vi) Rearrange the order

Jumbled sentences were given and the informants were asked to rearrange the sentences into a logical sequence by assigning a number to each sentences. (Task-19).

(vii) Questions and fill in the blanks
This mode of testing was administered in usage of inferences, (Task-18) where the informants had to fill up the blanks and answer various questions.

3.5.2.2. Data for testing the process of recall
(i) The process of Writing

The method adopted to test the process of recall involved writing of the recalled linguistic elements and messages. This mode of free recall was asked to be made by the informants in all recall tasks. Recalling the words (Task-8), analogies (Task-10), Antonyms (Task-12), Phrases (Task-21), individual sentences with idea units (Task-23), Jumbled Sentences (Task-24), and reading comprehension sentences (Task 25 and 26) the mode of free recall procedure was followed.

(ii) The process of Ticking

The process of ticking the sentences or words which the informants came across in the tasks conducted to test the level of understanding out of a list, were made in the delayed recognition task. This mode of procedure was adopted while picking up the right word and sentences in Task-9, Task-13, Task-22 and Task-23 and in task-11, by matching the right analogies.

3.5.2.2. Data for testing independent variables

The independent variables which has its influence as a factor in the understanding level were collected from the informants self report, which was based on the selectional procedure involving the process of ticking.
(i) level of Difficulty
The informants were asked to tick whether the item was easy or difficult. (Was it easy or difficult to answer? Easy_______ / Difficult_______)

(ii) Level of Prediction-Accuracy
The informants were certain or uncertain about their answers and this is measured through prediction-accuracy test. (Are you sure of the answer? Yes_____/ No_____)

(iii) Level of Frequency
When the informants answered the questions, the linguistic elements and messages were read either once or number of times. The number of trials of reading, are measured by the number of times stated by the informants.

   (How many times you went through the words?
   Once---twice----thrice----Many times------
   How many times you went through the sentence?
   Once---Twice----Thrice----Many times----
   How many times you went through the passage?
   Once---Twice----Thrice----Many times----)

(iv) Level of checking
Level of checking tests whether the linguistic units were read again after starting to answer the questions.

   (Did you go through the sentences again after starting to answer the question? Yes---- / No-----.
   Did you go through the passage again after starting to answer the question? Yes---- / No-----.)
(v) Reaction-time

The reaction-time can be defined as the time taken by the informants to read and answer the questions. The reaction-time starts as soon as the informants started reading and ends when the answers were completed. The reaction-time was collected by filling up (Starting time/ Ending time) the reaction-time column.

3.5.2.3. Other Variables

The other variables that are correlated with the independent and dependent variables were employed in single tasks and they are:

(i) Level of Understanding key words

In the process of understanding Antonyms (Task-12) the level of understanding key words were tested and the informants were asked to tick, which word gave the clue.

Which word gave the clue? First--Second-- Both.--

(ii) Level of Description and differentiation of error

During the process of understanding sentences with errors (Task-15) the informants were asked to find out whether their is any error in the sentence (differentiation) and what error? (description).

(Is there any error in the sentence? yes---/No----).
If yes what error?-----------------------

(iii) Level of analysing the topic

In the process of bringing logicality into an illogical
sequence (Task-19), the informants were asked to give an appropriate title for the sentences.

Give an appropriate title:--------

3.5.2.4. Data for collecting the attitudes

The data for different attitude were collected by the performance of ticking process.

(1) Attitude towards the cognitive process:
Which was easy? Understanding----recall----both-----.

(2) Attitude towards taking the test.
How did you take the test ? Seriously--Lightly-- Both--

(3) Attitude towards the test;
How was the test ? Interesting---boring ---both---.

3.6. The analyses of Data

The answers of the informants in the various task items, are categorized in different linguistic units and are counted and measured. These measures consists of assigning various numbers to objects and traits in an orderly way following a set pattern, depending on the features and nature of the traits and objects. Measurements represent the attributes, qualities, traits and variables in the form of quantities. Quantification gives a vivid picture of the intensity of the influence of variables and based on these measurements evaluation and conclusions are made. The traits which are tested and analysed are the variables and the highly organized number system gives the quantified classification of the qualities or the traits.
3.6.1. The scoring pattern

The scoring pattern varies depending on the variable that is stored. But there is a great deal of consistency, because individual variable carries the same score throughout the tests. The scoring pattern are assigned to find out the following:

1. Level of understanding of the items, is high or low.
2. Level of recall of items is high or low.
3. Level of recognition of the items is high or low.
4. Level of prediction accuracy of the items is high or low.
5. Level of checking is high or low.
6. Level of understanding key words is high or low.
7. Level of description and differentiation of error is high or low.
8. Level of analysing the topic is high or low.

The scoring patterns of various items starts invariably with zero score and the maximum score assigned depends on the variable measured. The scoring patterns of various variables are given in Table 3.3. The highest in understanding level, level of recall and recognition are 1 and the lowest is 0. The highest in level of frequency is 4 level of checking is 2, Level of prediction-accuracy is 2 level of description is 1 and differentiation is 2, level of analyzing the topic is 1 and the lowest score assigned to all these variables are invariably 0. The reaction-time is measured and the total time is presented in the form of seconds.

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3.6.2. The statistical analyses

The statistical analyses of the scores are made in different ways depending on the nature of data and the purpose of analysis.

3.6.2.1. Frequency count

The first phase of analysis is made by totalling the raw score, assigned as advocated in chart 3.3 for the variables of the different items in the units of various linguistic elements. For example in the process of understanding a word by all the informants the total score of the various words, individually and the scores of the independent variables are measured.

3.6.2.2. Measures of Central Tendency: Mean scores

The measures of the mean scores of the understanding levels of individual items in an unit are based on the number of correct answer and the measures of the correct answers of the understanding level. The mean scores of all the informants are changed into percentages to find out the mean scores of the individual in all the tasks for understanding, recall and recognition and to find out the mean scores of a task, derived by the percentages of all the informants. The method of deriving the mean scores of the variables are explained below:
### TABLE 3.3:
THE SCORING PATTERN USED IN THE ANALYSIS:

<table>
<thead>
<tr>
<th>The Variables</th>
<th>Levels</th>
<th>Units</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Understanding</td>
<td>Correct Answer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wrong Answer</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unanswered</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Dependent</td>
<td>Correct Recall</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Variables</td>
<td>Wrong Recall</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>(immediate recall)</td>
<td>left over item</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>(Delayed Recognition)</td>
<td>Correct recognition</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>wrong recognition</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Left-over item</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Level of Difficulty</td>
<td>Easy level</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Difficult level</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Easy/difficult</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>wrong answer</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Independent</td>
<td>Sure of Answer</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Variables</td>
<td>Not sure of answer</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>sure/not sure for</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>wrong answer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level of Frequency</td>
<td>Went through once</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Went through twice</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Went through thrice</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>went through manytimes</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>frequency for wrong</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>answer</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Did not go through the</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>sentence</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>went through the</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>sentence</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>for the wrong answer</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Level of Understanding</td>
<td>Both</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>First</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Second</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Level of Keywords</td>
<td>Correct differentiation</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correct</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wrong</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Answered</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Level of Analysing the</td>
<td>Topic</td>
<td>Unanswered</td>
<td>0</td>
</tr>
</tbody>
</table>
(a) Mean score for Different items

(1) Understanding level

The understanding level (UL) of all the informants (I) and their scores (S) are counted and divided by the total number of observations to get the mean score of an item.

\[ S + S + S + S + S + S + \ldots + S \]

\[ \text{UL} \]

\[ I \quad I \quad I \quad I \quad I \quad I \quad I \]

\[ 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 50 \]

\[ \text{UL} = \frac{\text{Total number of Observations}}{50} \]

(2) Recall level and Recognition Level

The recall level and recognition level (R) and their scores (S) are counted and divided by the total number of observations, like the understanding level, to get the mean scores of an item.

\[ S + S + S + S + S + S + \ldots + S \]

\[ \text{RL} \]

\[ R \quad I \quad I \quad I \quad I \quad I \quad I \]

\[ 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 50 \]

\[ \text{RL} = \frac{\text{Total number of Observations}}{50} \]

(3) Other variables

Level of frequency (FL), level of prediction - accuracy (PAL), understanding key words (UKW), level of checking (CL) and level of analysing the topic (LAT) the total scores of the informants are divided by the level of understanding.

\[ S + S + S + S + S + S + \ldots + S \]

\[ \text{FL} \]

\[ FL \quad FL \quad FL \quad FL \quad FL \quad FL \quad FL \]

\[ I \quad I \quad I \quad I \quad I \quad I \quad I \]

\[ 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 50 \]

\[ \text{FL} = \frac{\text{Total number of Observations}}{50} \]

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(b) The mean scores of the task:

The mean scores of the task is collected by totalling all the total answers of an informant in a task in both understanding level (UL) and recall, recognition level (RL).

**UL =** 
\[
S + S + S + S + S + S + S \quad \text{Number of Informants}
\]

**RL =** 
\[
S + S + S + S + S + S + S \quad \text{Number of Informants}
\]
(C) Mean scores of an individual for understanding and recall

The mean scores for understanding of words, sentences and recall/recognition of them are counted by getting the mean of the informants score in all the task(T) and divided by number of tasks.

(1) Understanding level of an unit

Illustration

Understanding Level of an informant in word in context

\[ \text{Understanding Level of an unit} = \frac{\text{UL} + \text{UL} + \text{UL}}{5 \ 6 \ 7} \]

Total number of Tasks (3)

(2) Understanding Level of a Linguistic Element:

Illustration:

Understanding level of an informant in sentence level

\[ \text{Understanding level} = \frac{\text{UL} + \text{UL} + \text{UL} + \text{UL} + \text{UL}}{14 \ 15 \ 16 \ 17 \ 18 \ 19 \ 20} \]

Total number of tasks (T)

Recall level of an informant in sentence level

\[ \text{Recall level} = \frac{\text{RL} + \text{RL}}{24 \ 25} \]

Total number of tasks (2)

3.6.2.2.4. Rank Order:

Based on the means of various dependent and independent variables ranks are assigned to the different items ranging from very high or very low. Table 3.4 present the rank order, the position and the symbol used. The assignment of ranks are described below.
(1) High level of understanding ranks very high «- and low level understanding ranks very low ». The rank goes down from very high to very low as the understanding level goes down.

(2) If the recall and recognition of words and sentences are high, very high rank «- is assigned, if they are low, very low rank is assigned-».

(3) If the level of difficulty is very low, it is ranked very high «-, if the level of difficulty is very high, it is ranked very low-».

(4) High score in prediction-accuracy is ranked very high «- and low score in prediction-accuracy is ranked very low -».

(5) The frequency level is very less the score assigned to it is high, «- and if frequency level is high it is ranked very low -».

(6) If the Reaction-time taken is less, high rank is assigned «- and if it is high, low rank is assigned.-».

(7) If the level of checking is low, it is ranked very high «- and if the level of checking is more, it is ranked very low-».

(8) If the understanding of the key words are high, very high rank is assigned«-, if the understanding level of key words are less, very low rank is assigned-».

(9) If the level of differentiation and description of errors are high, it is ranked very high «- and low level is ranked very low -».
3.6.2.2.5. Rank difference co-efficient of correlation

Based on the rank order correlation co-efficient is worked out following the method of Spearman's rank-difference co-efficient of correlation. The formula used is:

\[
\Gamma = 1 - \frac{6 \times \sum D^2}{N \times (N - 1)}
\]

The symbol \((\Gamma)\) is used to denote correlation and the correlation are worked out between the following:

(i) Independent variable and dependent variable

1) Between Level of understanding and level of difficulty.
2) Between Level of understanding and level of Prediction-accuracy.
3) Between Level of understanding and level of Frequency.
4) Between Level of understanding and level of understanding key words.
5) Between Level of understanding and level of checking.
6) Between Level of understanding and level of description and differentiation of errors.
7) Between Level of understanding and level of analysing the topic.
8) Between Level of understanding and Reaction-time.
9) Between Level of understanding and immediate recall.
10) Between Level of understanding and delayed recognition and recall.
11) Between immediate recall and delayed recognition /recall.
(12) Between immediate recall and reaction-time.
(13) Between delayed recall and reaction-time.
(14) Between Association level and level of features.
(15) Between Association level and Reaction-time.

(ii) Independent variable and independent variable
(1) Understanding level and immediate recall.
(2) Understanding level and delayed recall.
(3) Immediate recall and delayed recall/recognition task.

(iii) Dependent variables and dependent variable
(1) Level of difficulty and level of prediction-accuracy.
(2) Level of difficulty and level of frequency level.
(3) Level of difficulty and level of understanding key words.
(4) Level of difficulty and level of differentiation and description of errors.
(5) Level of difficulty and level of checking.
(6) Level of difficulty and level of analysing the topic.
(7) Level of difficulty and reaction-time.
(8) Level of prediction-accuracy and level of understanding key words.
(9) Level of prediction-accuracy and level differentiation and description of errors.
(10) Level of prediction-accuracy and level of checking.
(11) Level of prediction-accuracy and level of analysing the topics.
(12) Level of prediction-accuracy and level of frequency.
(13) Level of prediction-accuracy and level of reaction-time
(14) Level of frequency and level of understanding key words
(15) Level of frequency and level of differentiation and description of errors.
(16) Level of frequency and level of checking.
(17) Level of frequency and level of analysing the topics.
(18) Level of frequency and level of reaction-time.

**TABLE 3.4 THE STRUCTURE OF RANK ORDER**

<table>
<thead>
<tr>
<th>RANK</th>
<th>TASKS WITH 10 ITEMS</th>
<th>TASKS WITH 5 ITEMS</th>
<th>TASKS WITH 6 ITEMS</th>
<th>TASKS WITH 4 ITEMS</th>
<th>TASKS WITH 2 ITEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO OF ITEMS</td>
<td>POSI SYM</td>
<td>TION BOL</td>
<td>POSI SYM</td>
<td>TION BOL</td>
<td>POSI SYM</td>
</tr>
<tr>
<td>1</td>
<td>VERY HIGH</td>
<td>&lt;&lt;&lt;</td>
<td>VERY HIGH</td>
<td>&lt;&lt;&lt;</td>
<td>VERY HIGH</td>
</tr>
<tr>
<td>2</td>
<td>VERY HIGH</td>
<td>&lt;&lt;&lt;</td>
<td>HIGH</td>
<td>&lt;-</td>
<td>HIGH</td>
</tr>
<tr>
<td>3</td>
<td>HIGH</td>
<td>&lt;-</td>
<td>NEITHER HIGH NOR LOW</td>
<td>&lt;-&gt;</td>
<td>NEITHER HIGH NOR LOW</td>
</tr>
<tr>
<td>4</td>
<td>HIGH</td>
<td>&lt;-</td>
<td>LOW</td>
<td>-&gt;</td>
<td>NEITHER HIGH NOR LOW</td>
</tr>
<tr>
<td>5</td>
<td>NEITHER HIGH NOR LOW</td>
<td>&lt;-&gt;</td>
<td>VERY LOW</td>
<td>&lt;-&gt;</td>
<td>LOW</td>
</tr>
<tr>
<td>6</td>
<td>NEITHER HIGH NOR LOW</td>
<td>&lt;-&gt;</td>
<td>VERY LOW</td>
<td>&lt;-&gt;</td>
<td>LOW</td>
</tr>
<tr>
<td>7</td>
<td>LOW</td>
<td>-&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>LOW</td>
<td>-&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>VERY LOW</td>
<td>-&gt;&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>VERY LOW</td>
<td>-&gt;&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(19) Level of understanding key words and reaction-time.
(20) Level of differentiation and description of error and reaction time.
(21) Level of checking and reaction-time.

3.6.2.2.6. Test of significance of difference

The statistical method of test of significance of differences is made by using the formula,

\[ t = \frac{(M_1 - M_2) - 0}{SE_{D}} \]

and various levels of differences are analysed;

(i) Difference between various mode of items

To test the differences in the process of organization of various processes and the manner of organization of processes, between various test items in a unit, 't' test is used.

(ii) Difference between various testing matters or units

To test the difference between various testing matters, the score of the informants are changed into percentages and based on the mean calculated, the 't' test is made to examine the difference between various tasks and various testing units.

(iii) Difference between various Linguistic elements

The test of significance is made to find out the differences in the levels of understanding and recall between words and sentences.

(iv) Difference between Cognitive processes

The difference between two main cognitive activity of
understanding and recall are tested to observe in which process the informants excel.

Both in the test of Significance and Rank difference coefficient of correlation the levels of significance at 0.01, 0.05 and 0.10 are assessed.

3.7. Discussion of results

Based on the statistical analysis certain conclusions are made.

(1) Rank Order

The rank order signifies the position of the various items in level of understanding, level of recall, level of difficulty, level of prediction-accuracy, level of frequency, reaction-time and other variables.

(2) Test of Significance

Test of Significance of difference helps to come to a conclusion regarding various levels explained in 3.6.2.2.6.

(3) Rank-Difference co-efficient of Correlation

Based on the correlation of variables(3.6.2.2.5) different predictions are made in every tasks based on the rank order of all the items. Two symbols are used; ie., directly proportionate $\alpha$ and indirectly proportionate $1/\alpha$. In all the experiments the predictions made on the variables are tested and analysis of the results of the variables are made based on the acceptance and non-acceptance of the prediction and, the various predictions are listed below:
<table>
<thead>
<tr>
<th>Prediction NO.</th>
<th>symbol used</th>
<th>Explanation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prediction-1</td>
<td>UL $\alpha$ 1/DL</td>
<td>If understanding level(UL) is high level of difficulty (DL) should be low. So level of understanding is indirectly proportional to difficulty level.</td>
</tr>
<tr>
<td>Prediction-2</td>
<td>UL $\alpha$ PA</td>
<td>If understanding level(UL) is high, the level of prediction-accuracy (PAL) should be high. so level of understanding is directly proportional to prediction accuracy level.</td>
</tr>
<tr>
<td>Prediction-3</td>
<td>UL $\alpha$ 1/FL</td>
<td>If understanding level(UL) is high level of frequency (FL) should be low.</td>
</tr>
<tr>
<td>Prediction-4</td>
<td>UL $\alpha$ UKW</td>
<td>If understanding level(UL) is high level of understanding key words (UKW) should be high.</td>
</tr>
<tr>
<td>Prediction-5</td>
<td>UL $\alpha$ LDD</td>
<td>If understanding level(UL) is high level of description and differentiation of error should be high.</td>
</tr>
<tr>
<td>Prediction-6</td>
<td>UL $\alpha$ CL</td>
<td>If understanding level(UL) is high level of checking (CL) should be Low.</td>
</tr>
<tr>
<td>Prediction-7</td>
<td>UL $\alpha$ LAT</td>
<td>If understanding level(UL) is high</td>
</tr>
</tbody>
</table>
Prediction-8 UL α 1/RT  
level of analysing the topic (LAT) 
Should be high.
If understanding level (UL) is high 
level of Reaction-time (RT) should 
be low.

Prediction-9 AL α 1/LFS  
If level of Association (AL) is high 
level of features (LFS) should be low.

Prediction-10 AL α RT  
If level of Association (AL) is high 
level of Reaction-time (RT) should be high.

Prediction-11 DL α 1/PAL  
If level of difficulty (DL) is low 
level of prediction-accuracy (PAL) 
should be high.

Prediction-12 DL α FL  
If level of Difficulty (DL) is low 
level of frequency (FL) should be low.

Prediction-13 DL α 1/UKW  
If level of Difficulty (DL) is low 
level of understanding key words 
(UKW) should be high.

Prediction-14 DL α 1/LDD  
If level of Difficulty (DL) is low 
level of description and different 
ation of error should be high.

Prediction-15 DL α CL  
If level of Difficulty (DL) is low 
level of checking should be low.
Prediction-16 DL a 1/LAT  If level of Difficulty (DL) is low level of analysing the topic (LAT) should be high.

Prediction-17 DL a RT  If level of Difficulty (DL) is low level of reaction-time (RT) should be low.

Prediction-18 PAL a UKW  If level of Prediction Accuracy (PAL) is high, level of understanding key words (UKW) should be high.

Prediction-19 PAL a LDD  If level of Prediction Accuracy (PAL) is high, level of description and differentiation of error should be high.

Prediction-20 PAL a 1/LC  If level of Prediction Accuracy (PAL) is high, level of checking should be low.

Prediction-21 PAL a LAT  If level of Prediction Accuracy (PAL) is high, level of analysing the topic should be high.

Prediction-22 PAL a 1/FL  If level of Prediction Accuracy (PAL) is high, level of frequency should be low.

Prediction-23 PAL a 1/RT  If level of Prediction Accuracy (PAL) is high, level of Reaction Time should be low.

Prediction-24 FL a 1/UKW  If level of Frequency is low, level
of understanding key words should be high.

Prediction-25 FL α 1/DDL If level of Frequency is low, level of description and differentiation of error should be high.

Prediction-26 FL α 1/CL If level of Frequency is low, level of checking should be low.

Prediction-27 FL α 1/LAT If level of Frequency is low, level of analysing the topic should be high.

Prediction-28 FL α 1/RT If level of Frequency is low, level of reaction-time should be low.

Prediction-29 DDL α 1/RT If level of description and differentiation of error is high, reaction time should be low.

Prediction-30 CL α RT If level of checking is low, level of reaction-time should be low.

Prediction-31 LAT α 1/RT If level of analysis of the topic is high, level of reaction-time should be low.

Prediction-32 UL α IR If level of understanding is high, level of immediate recall (IR) should be high.

Prediction-33 UL α DR If level of understanding is high, level of delayed recognition (DR) should be high.

Prediction-34 IR α DR If immediate recall (IR) is high
Prediction-35 IR $\alpha$ RT delayed recall(DR) should be high. If immediate recall is high reaction-time should be high. It denotes that the process involved is low speed search process, if there is no correlation then the problem may be high speed search process.

Prediction-36 DR $\alpha$ RT If delayed recall/recognition is high, the reaction-time should be high, it means that the process involved is low-speed scanning process, if there is no correlation the possibility of high speed scanning process is evident.

The experiments were conducted based on the methods explained so far and the results acquired in the experiments are reported in the following chapters.