Chapter – VI

Findings and Summary
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### FINDINGS AND SUMMARY

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CHAPTER - VI

FINDINGS AND SUMMARY

Cognitive psychology deals with studying mental processes such as attention, perception, sensation, concept formation, memory, problem solving, information processing, reasoning and judgement. All these relate with teaching and learning. Effective teaching and learning depend upon how one is perfect in all the mental processes (S. K. Mangal, 2002).

Memory is mind's storehouse and the reservoir of accumulated learning. To the Roman statesman Cicero, memory was “the treasury and guardian of all things.” To a psychologist, memory is any indication that learning has persisted over time (Raj Bapna, 2000).

Chemistry is the integrated study of the preparation, properties, structure and reactions of the chemical elements and their compounds. Chemistry is considered an important subject in school and college curriculum as many professional and applied courses, directly or indirectly use of knowledge of chemistry. Moreover, the present age is the era of science and more number of people are being employed in scientific pursuits which require knowledge of chemistry. Chemistry education is also necessary because of its immense value in the student's individual life as well as in society. The science that studies the composition, properties and activity of substances and various elementary forms of matter. Scientific study of substances and how they change when they combine (Yadav, 2006).

Chemistry education (or chemical education) is a comprehensive term that refers to topics related to the study or description of the teaching and learning of chemistry in schools, colleges and universities. Topics in chemistry education might include understanding how students learn chemistry, how best to teach chemistry and how to improve learning outcomes by changing teaching methods and appropriate training of chemistry instructors, within
many modes, including classroom lecture, demonstrations and laboratory activities.

There is a constant need to update the skills of teachers engaged in teaching chemistry and so chemistry education speaks to this need (Yadav, 2006).

6.1. STATEMENT OF THE PROBLEM

Memory is important for getting more marks in Chemistry. Because there are many concepts in chemistry parts like periodic table, equations, structure of the compounds, experiments, properties of elements in which memory plays an important role. Many memory techniques are essential to memorise all these concepts. Students have to remember to perform well in the test and examination.

Apart from the memory strategies, relaxation techniques like Meditation, Alpha breathing, Mind power music, and Mind machine helps to enhance memory. Minerals like Iron, Iodine, and Zinc, and amino acids like tryptophane which are present in the food which we eat also helps to improve memory.

The main purpose of the study is to enhance the achievement in chemistry by teaching Memory Strategies and Relaxation Techniques cum Nutrition. In order to enhance the chemistry achievement by improving the memory of the students, this study is undertaken. Thus the problem identified is “Effect Of Memory Enhancing Strategies On Academic Achievement Among Engineering Chemistry students”.

6.2. NEED AND SIGNIFICANCE OF THIS STUDY

Chemistry & Education: Universities and colleges provide teaching and training for bright young people in the basics of chemical science and engineering, both for students specializing in chemistry and for others who
need the underpinning experience of chemistry for their own particular scientific, professional or technical education.

Of course, provision of an educational training in chemistry does not begin at university. It starts at primary school with an introduction to observation and embryonic interpretation of phenomena and continues through early, middle and later schooling. There are deep worries within the chemistry community that the educational provision in science in some countries is lacking in appropriate resourcing and basic training, particularly in mathematical skills and in developing a familiarity with the philosophy of physical science.

Schools and school teachers, universities as teachers of teachers and adult teaching institutions all have a major contribution to make in improving society's knowledge of science and technology. Science teaching must be better funded and empowered through better training to deliver higher standards in science education. Education must continue for our workforce throughout the working life. Education must be seen as a European matter - a fundamental basis for a modern society.

Fortunately, in most countries in Europe chemistry and chemical engineering are highly regarded as professions. However, in some countries this is not the case, with adverse consequences for practitioners of the sciences and public perception of its activities and benefits. Much more effort must be put into the careful training and selection of science teachers, particularly chemistry teachers, and into the promotion of a more balanced view of the benefits as well as the responsibilities of chemistry as a science.

An improved standard of general science education for all is essential for future success. Without knowledge of basic scientific matters, of concentration, of risk and probability, and of the properties of materials and molecules, a science-based industrial society cannot function democratically.
As we see daily in our media, a society with widespread scientific ignorance is all too easily influenced by facts incorrectly reported or interpreted in an unbalanced way.

Wider scientific education and more effective programmes to increase public recognition of the positive role of chemistry in wealth creation and improving the quality of life are needed. Such programmes might usefully be initiated in consultation with the partners of the All Chemical Engineers. Academic institutions and the chemical industry accept that it is necessary to demonstrate that the advanced technology used in industry is both safe and responsibly managed.

6.3. RESEARCH QUESTIONS

1. How to improve memory of engineering Students?
2. How to improve Chemistry achievement of engineering students?
3. Is it possible to improve memory through meditation?
4. What is the effect of food on memory?
5. Is it possible to improve memory through healthy and nutritious food?
6. What are memory enhancing strategies?
7. How to make the students to remember the concepts in chemistry better?
8. How to make the students to remember better concepts in chemistry such as number of elements name?
9. Will memory enhancing strategies helpful to improve the achievement in Chemistry?
10. How to evolve a model to improve the memory of students?
6.4. OBJECTIVES

1. To find out the impact of
   a) Memory Enhancing Strategies (Group II)
   b) Relaxation Techniques cum Nutrition (Group III)
   c) Memory Enhancing Strategies and Relaxation Techniques cum Nutrition (Group IV) on chemistry achievement among Engineering Students.

2. To find out the impact of
   a) Memory Enhancing Strategies (Group II)
   b) Relaxation Techniques cum Nutrition (Group III)
   c) Memory Enhancing Strategies and Relaxation Techniques cum Nutrition (Group IV) on enhancing memory among Engineering Chemistry Students.

3. To find out the relationship between the memory and chemistry achievement of control group with other groups (Group II, III, & IV)

4. To find out the relationship between the memory and chemistry achievement of control group with other groups (Group II, III, & IV) with respect to the demographic variables (Gender, Subject studied in +2 and Locality)

6.5. HYPOTHESES

1. There is no significant difference among all the four groups with respect to achievement in chemistry and memory quotient.

2. There is no significant difference between the mean scores of pre and post test of all groups with regard to chemistry achievement
3. There is no significant difference between mean scores of pre and post test of all groups with regard to memory quotient.

4. Group 1 (Control Group) Male and Female students do not differ in chemistry achievement and memory quotient (MQ) in pre and post test.

5. Male and female students of Group 2 do not differ in pre post and gain scores of chemistry achievement and memory quotient.

6. Male and Female students of Group 3 do not differ in pre, post and gain scores of chemistry achievement and memory quotient.

7. Male and Female students of Group 4 do not differ in chemistry achievement and memory quotient in pre, post and gain scores.

8. Computer Science and Biology Students of Group 1 do not differ in chemistry achievement and memory quotient in pre, post and gain scores.

9. Biology and computer Science students of Group 2 do not differ in chemistry achievement and memory quotient in pre, post and gain scores.

10. Group 3 Biology and computer science students do not differ in chemistry achievement and memory quotient in pre, post and gain scores.

11. Biology and computer science of Group 4 students do not differ in chemistry achievement and memory quotient in pre, post and gain scores.

12. Urban and Rural students of Control Group do not differ in chemistry achievement and memory quotient in pre, post and gain scores.

13. Urban and Rural students of Group 2 do not differ in chemistry achievement and memory quotient in pre, post and gain scores.

14. Urban and Rural students of Group 3 do not differ in pre, post and gain scores of chemistry achievement and memory quotient.

15. Urban and Rural students of Group 4 do not differ in pre, post and gain scores of chemistry achievement and memory quotient.

16. There is no association between groups and level of gain in achievement in chemistry.
17. There is no association between groups and level of gain in memory quotient.

18. There is no correlation among pre, post and gain scores of chemistry achievement and memory quotient.

19. There is no correlation among pre, post and gain scores of chemistry achievement and memory quotient of (Group I) control group.

20. There is no correlation among pre, post and gain score of achievement and memory quotient of (Group II) memory enhancing strategies.

21. There is no correlation among pre, post and gain score of chemistry achievement and memory quotient of (Group III) RT cum nutrition.

22. There is no correlation among pre, post and gain scores of achievement and memory quotient of Group MES and RT cum nutrition.

6.6. RESEARCH DESIGN

Research design is the strategy the plan and the structure of conducting research projects (Eagle word cliffs, N.T. 1981). The investigator administered a pre-assessment to measure memory and chemistry achievement as present level among Engineering chemistry students. The experimental treatment is given. The post test is conducted to measure the level of memory and achievement in chemistry among Engineering Chemistry students.

Experimental Research

Experimental research has six distinguishing characteristics, statistical equivalence of subjects in different groups usually achieved by random assignment of subjects, comparison of two or more groups or set of conditions; direct manipulation of at least one independent variable; measurement of each dependent variable; use of inferential statistics and a design that provides maximum control of extraneous variables.

True experimental designs
Findings and Summary

Two designs that have been called the experimental designs. Include procedures for ruling out inter subject differences through randomization of subjects to groups and both include manipulation of the treatment variable. It would also be possible to combine several different treatments with a control group as shown in chapter IV.

6.7. PARTICIPANTS

Participants were 120 Engineering college students from Vinayaga Missions Kirubananda Variyar Engineering College, Salem. All 120 students were from Chemistry subjects. Out of 120 students, 60 were female students and 60 were male students form four groups. Group 1 is the control group. Group 2 was exposed to Memory Enhancing Strategies, Group 3 was exposed to Relaxation Techniques cum Nutrition and Group 4 was exposed to Memory Enhancing Strategies and Relaxation Techniques cum Nutrition. Each group consists of 15 male students and 15 female students.

6.8. INSTRUMENTATION

Achievement Test

The Achievement Test was developed by the investigator. It consists of two parts. The first part consists of 19 questions carrying 2 marks per question. The second part consists of one question carrying 12 marks. The test is used to rate students in two different occasions like pre-assessment and post-assessment. The reliability of the tool is found by split-half method. The r-value is found to be 0.83 which shows high reliability of the tool. Experts opinion form the validity of the tool.

Wechsler Memory Scale

Wechsler memory scale was developed by Wechsler was the tool adopted by the investigator. It consists of seven parts namely personal and current information, orientation, mental control, Immediate recall, digits forward and digits backward, visual reproduction and associate learning, measuring memory. The tool is a standardised tool.
6.9. PHASES OF EXPERIMENT

Researcher has planned to select four groups of engineering students from EEE branch in V.M.K.V E.C Salem. All the students are staying in college hostel. Each group has 15 male and 15 female students. Total number of students is 120. Each group of students has been selected from each section.

<table>
<thead>
<tr>
<th>Experiment phase</th>
<th>Activity</th>
<th>Duration</th>
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<tbody>
<tr>
<td>Phase I</td>
<td>Pre assessment</td>
<td>2 months</td>
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<tr>
<td>Phase II</td>
<td>Intervention</td>
<td>4 months each</td>
</tr>
<tr>
<td>Group No</td>
<td>Name of the strategy</td>
<td>Duration</td>
</tr>
<tr>
<td>1.</td>
<td>No intervention</td>
<td>4 months</td>
</tr>
<tr>
<td>2.</td>
<td>Memory enhancing strategies</td>
<td>4 months</td>
</tr>
<tr>
<td>3.</td>
<td>Relaxation techniques cum nutrition</td>
<td>4 months</td>
</tr>
<tr>
<td>4.</td>
<td>Memory enhancing strategies and relaxation techniques cum nutrition</td>
<td>4 months</td>
</tr>
<tr>
<td>Phase III</td>
<td>Post assessment</td>
<td>2 months</td>
</tr>
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However the total duration for the interaction program taken by investigator is 8 months

6.10. FINDINGS AND DISCUSSION

*Groups do not differ ('p' > 0.05) in chemistry achievement and Memory quotient with regard to pre test scores*

- All the Four Groups differ significantly (highly significant 'p' < 0.01) in chemistry achievement with regard to post test score.
Control group significantly differ in chemistry achievement in the post test with other Groups, Group II (memory enhancing strategies), Group III (Relaxation technique cum nutrition) and Group IV (MES and Relaxation Technique cum nutrition).

Group II (Memory Enhancing strategies) significantly differ in chemistry achievement with regard to post test with Group IV (Memory Enhancing strategies and Relaxation Technique cum Nutrition).

Group III (Relaxation Technique cum nutrition) significantly differ in chemistry achievement with regard to post test with Group IV (Memory Enhancing Strategies and RT cum Nutrition).

Group II (MES) do not differ in chemistry achievement of the post test with Group 3 (RT cum nutrition).

All the four groups differ significantly (highly significant ‘p’<0.01) in memory quotient with regard to post test scores.

Control group significantly differ in memory quotient in the post test with other groups, Group II (Memory Enhancing Strategies), Group III (RT cum Nutrition) and Group IV (MES and RT cum Nutrition).

Group II (MES) differ significantly in memory quotient with regard to post test with Group IV (MES and Relaxation Techniques cum nutrition).

Group III (Relaxation Techniques cum nutrition) significantly differ in memory quotient post test with Group IV (MES and Relaxation Technique cum nutrition).

Group II (MES) do not differ significantly in memory quotient with Group III (Relaxation- Techniques cum nutrition).

In Group I, the memory enhancement of chemistry achievement and memory quotient post test is not improved due to no application of memory enhancing strategies and relaxation Techniques cum nutrition.

In Group II, the memory enhancement of chemistry achievement and memory quotient post test are improved due to the application of memory enhancing strategies as supported by the findings of the studies.
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❖ In Group III, the memory enhancement of chemistry achievement and memory quotient post test are improved due to the application of Relaxation Techniques cum Nutrition as supported by the findings of the studies conducted by McGlynn, F. Dudley; And Others (1978), Throll, D. A (1981), Cullen, Audrey; And Others (1987) and Matthews, Doris B.; Quinn, Jimmy L. (1987).

❖ In Group IV, the memory enhancement of chemistry achievement and memory quotient post – test is due to the application of memory enhancing strategies and Relaxation Techniques cum Nutrition as supported by the findings of the studies conducted by Taras, Howard (2005), Charlton-Seifert Joan; (1979), Pertz, Doris L.; Putnam, Lillian R. (1982) and Crews, Cecilia N. (1989)

Memory enhancing strategies and Relaxation Techniques cum nutrition groups equally improved in chemistry achievement and memory.

But when compared to these 2 groups (II & III groups) Group IV MES and Relaxation Techniques cum nutrition highly improved in chemistry achievement and memory quotient of Engineering Students. In overall performance of the four groups, group IV show highest improvement in chemistry achievement and memory quotient.

❖ In control group, male and female students do not differ in the achievement post and gain score and memory pre, post and gain score but male and female students differ significantly in the achievement pre test. The memory enhancement of achievement in chemistry is not improved due to there is no application of memory enhancing strategies and RT cum nutrition.
In Group II male and female students differ significantly in the achievement pre and post and memory quotient pre, post and gain score male and female do not differ in the achievement gain score.

In Group III male and female students differ significantly in the memory quotient post and gain score male and female students do not differ in the achievement pre, post and gain score and memory quotient.

In Group IV, male and female students differ highly significantly in the achievement pre test.

Male and female students differ significantly in the achievement post test and memory quotient pre test. Male and female students do not differ in achievement gain score and memory quotient post and gain score.

In Group I Biology and computer science differ highly Significant in memory quotient. Biology and computer science students differ significantly in memory quotient post test. Biology and computer science students do not differ in achievement pre, post and gain scores and memory quotient gain scores.

In Group II, Biology and computer science students do not differ in achievement and memory quotient pre, post and gain scores.

In Group III, Biology and computer science students differ in achievement post test. Biology and computer science students do not differ in achievement pre and gain scores and memory quotient pre, post and gain scores.

In Group IV, Biology and computer science students do not differ in achievement and memory quotient pre post and gain scores.

In Group I, Urban and rural students highly significant in achievement and memory quotient pre and post test. Urban and biology students do not differ in the achievement and memory quotient gain scores.

In Group II, Urban and rural students differ significantly in achievement and post test and memory quotient pre and post test. Urban
and Rural students do not differ in achievement pre and gain and memory quotient gain scores.

- In Group III, Urban and rural students differ highly significant in achievement pre and post test. Urban and Rural students differ significantly in memory quotient pre test. Urban and Rural students do not differ in the achievement gain scores and memory quotient post and gain scores.

- In Group IV, Urban and rural students differ highly significant in achievement post and gain scores. Urban and Rural students differ significantly in memory quotient pre test. Urban and Rural student do not differ in the achievement pre test and memory quotient post and gain scores.

- There is association between groups and level of gain score in chemistry achievement.

- There is association between groups and level of gain score in memory quotient.

6.11. EDUCATIONAL IMPLICATIONS

Learning is the most important factor of memory. Improvement of memory to a large extent rests upon this factor which can be improved by training. Improvement in learning is mainly influenced by (a) the techniques and methods of learning, (b) the learning situations and environment, and (c) the learner's state of mind. Improvement in all these aspects calls for interest and earnestness on the part of the learner.

Educational process has the focus to develop the cognitive abilities. Cognitive and Gestalt – theories have great implication in human learning. Higher needs are concerned with cognitive functioning. There are various processes and functioning involved in the cognitive abilities. Higher objective of teaching learning-analysis, synthesis and evaluation are achieved with help of cognitive functioning, thinking reasoning, perception and problem solving.
These are also termed to understand the nature of these for organizing effective teaching-learning and to realize the higher objectives of teaching.

The teacher's responsibility is to encourage the learners to acquire and to retain the knowledge imported in school for future use in meeting life problems. But to our great surprise we find that students forget most of the school learning after a short lapse of time. The basic question is, why do we forget? We will examine the causes of forgetting and the various techniques which can be used by class room teachers to minimize the percentage of forgetting and to make the process of acquisition of knowledge more efficient and lasting for the students. Traditionally, we hold that we learn by practice and forget because we fail to practice. This common view has been recently challenged by experimental psychologists. Forgetting occurs only when some learning takes place. If there is no learning, then there is no forgetting. It is incorrect to say that forgetting anything which was never learned. Forgetting is an inevitable commitment of learning. Thus failure to learn is one of the most common reasons why students are unable to recall answers to examination questions. As a matter of fact learning requires active rehearsal of what is to be learned. It means recalling relevant information, grasping fundamental principles and concepts that underlie a learning task and memorizing facts.

The teacher should understand the related concepts to learning's-retention, remembering, understanding, adaptation and forgetting for organizing effective teaching – learning process.

(i) Memory maps help to remember the units of the subject or the summary of the text of the whole chapter.

(ii) Visualisation of the diagrams of science, functioning of different systems in science or social science help in better remembering.

(iii) Grouping using the first letters of each of the number of items to be remembered if they are more. Eg. If capitals of different nations are to be remembered grouping could be done alphabetically and number the group
and the number of names of places in that group to be learned and remembered. Grouping- A telephone number 567345234 can be easily memorised by grouping as 567 345 234. If the number is small one can use the first letters to coin a word.

eg. VIBGYOR to remember the colours of rainbow in the order.

(iv) Association technique could be used to learn and remember the new word with the familiar word or opposite characters of two theories or two or more phenomena to learn.

Our present educational system presents a lot of information to be remembered in the form tests and examinations. Hence it is the responsibility of the teachers to provide the strategies to remember the information better. Learning to learn is the slogan of today. Helping the students to learn better is the basic competence required for the teachers. Thus memory enhancing strategies help the learners to memorise and remember the content in chemistry better.

These strategies make the learning material more interesting and improve chances of recalling it. It also organizes the material and relates it to what was already known. These strategies take longer than simply reading a chapter does, but it will save time later on when studying for exams.

These strategies improve exam performance. It ties the new material to information already in memory and it generates a multitude of retrieval cues to help recall the material when reed it. Mennonites, people skilled at using memory teaching use frequently have compelling reasons for developing their memories.

These techniques are used to remember more information more accurately. These techniques increase information entry in to long term memory and also increase retention.
Teaching these strategies is essential for chemistry learners to apply and practice these memory enhancing strategies.

6.12. SUGGESTIONS FOR FURTHER RESEARCH

- Similar studies can be conducted to know the effect of memory enhancing strategies in other subjects like botany, zoology also.

- Separate studies can be carried out to know in detail the effect of memory enhancing strategies, relaxation techniques and nutrition etc.

- Studies can be attempted to test the effect of memory enhancing strategies on chemistry achievement among Higher Secondary and B.Sc and M.Sc Chemistry students.

- Attempts should be made to assess the neuro-chemical aspects correlates of memory.

- Studies can be attempted to know the combined effect of memory and attention on learning of different subjects.

- Investigations can also be carried out to know the effect of memory on emotions.

- Research can be undertaken to assess the effect sleep on memory.

- Studies can be conducted to assess the attitude of Teachers on teaching memory enhancing strategies at secondary and higher secondary level.

- Studies can be made to assess the prevalence of learning difficulties and memory deficiency among students English at primary, secondary and higher secondary level.

- Separate studies can be attempted to know the various imaging techniques available to know role of brain and memory.