

CHAPTER - V

**FINDINGS, DISCUSSIONS,
SUMMARY
AND IMPLICATIONS**

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5.0.0 INTRODUCTION

The present study was planned to investigate the effectiveness of instructional strategy for teaching of chemistry to VII standard. Introduction and review of researches are presented in chapter I and chapter II respectively. The methodology employed for the study along with the technique of sample collection, design of the study, tools, procedure of data collection and the statistical techniques for analysis of data are presented in Chapter III. The results and its interpretations are presented in chapter IV. The present chapter includes findings, discussions, summary and implications. The purpose of the final chapter is to discuss the findings of the current study in light of relevant research. This section includes a summary of the study results, followed by a discussion of the findings and the implications of such for educational practice. The chapter also addresses the delimitations of the study and presents recommendations for further research.

5.1.0 FINDINGS

The following findings flow from the interaction of the data presented in the previous chapter.

1. The developed instructional strategy was effective in terms of students' achievement in chemistry.
2. The developed instructional strategy was effective in terms of students' reactions towards the instructional strategy.
3. The treatment produced a significant differential effect on the achievement of students in chemistry.
4. There was no significant differential effect of gender on the achievement of students in chemistry.

5. The interaction of treatment and gender did not produce a significant differential effect on the achievement of students in chemistry.
6. There was no significant differential effect of style of learning and thinking on the achievement of students in chemistry.
7. The interaction of treatment and style of learning and thinking did not produce a significant differential effect on the achievement of students in chemistry.
8. There was no significant differential effect of parental profession on the achievement of students in chemistry.
9. The interaction of treatment and parental profession did not produce a significant differential effect on the achievement of students in chemistry.
10. The interaction of gender and parental profession did not produce a significant differential effect on the achievement of students in chemistry.

The discussions related to each of these findings are presented under different captions, below.

5.2.0 EFFECTIVENESS OF INSTRUCTIONAL STRATEGY

The effectiveness of instructional strategy was studied in terms of the achievement of students in chemistry, and reaction of students towards the strategy. The discussions are presented in the captions 5.2.1 and 5.2.2.

5.2.1 Effectiveness of Instructional Strategy in terms of Achievement of Students in Chemistry

Instructional strategy was found to be effective in terms of student's achievement in chemistry. During teaching through the developed instructional strategy, the teacher guided the students from one phase of activity to the other. The climate of the classroom was open, co-operative and encouraging with the scope for good deal of students' activity. The instructional strategy thus, provided wide opportunity to students for acquiring concepts, interpreting the data and applying the principles in new and different situations.

The nature of the approach demands greater involvement of pupils in teaching learning situation. So the students were motivated and performed well. Different examples which were presented during teaching might have aroused interest and motivation among the students to study chemistry. Thus, interest and motivation

might have contributed to the present result. Due to the MCQ type test items, pupils' achievement might have been higher. Thus, teaching through the developed instructional strategy was found to be effective in terms of student's achievement in chemistry.

5.2.2 Effectiveness of Instructional Strategy in terms of Reaction of the Students towards the Strategy

Instructional strategy was found to be effective in terms of student's reactions towards the strategy. The various aspects of teaching were taken into consideration. Majority of the students expressed favorable reactions towards those above said aspects. Thus, it can be concluded that the favorable reactions of majority of students towards the mentioned aspects to be of importance. Normally people express their favorable reactions towards an object whenever they feel that object is of some use to them, interests them helps them in attaining the goals. The present finding in respect to the developed instructional strategy can be viewed in the context of the above mentioned reasons and it may, therefore be said that the students expressed favorable reactions towards the strategy.

5.3.0 EFFECT OF TREATMENT, GENDER AND THEIR INTERACTION ON ACHIEVEMENT IN CHEMISTRY

The discussions related to the effect and interaction of treatment and gender on the achievement of students in chemistry are presented in the caption 5.3.1, 5.3.2, 5.3.3.

5.3.1 Effect of Treatment on Achievement in Chemistry

There was a significant differential effect of treatment on the achievement of students in chemistry. Therefore, it can be said that the achievement in chemistry is dependent upon the method of instruction. This finding is supported by the findings of Aziz (1990), Jamini (1991), Remadevi (1998), Sreelekha and Nayar (2004), Luckpoteea, and Narod (2012), who found teaching through the concept attainment model to be effective in their studies. It is also supported by the findings of Aloraini (2012), Su (2011), Oskay and Dinçol (2011), Morais and Paiva (2007), Su (2007), Yakmaci-Guzel and Adadan (2013), Kozma and Russell (1997), who found that teaching through multi-media produced positive effects on achievement in chemistry. The reasons could be that the climate of the classroom

was open and free, co-operative and encouraging with the scope for good deal of students' activity. The instructional strategy, thus, provided wide opportunity to students for acquiring concepts, interpreting the data and applying the principles in new and different situations.

The nature of the approach demanded greater involvement of pupils in teaching learning situation. So the students were motivated and performed well. Different examples which were presented during teaching might have aroused interest and motivation among the students to study chemistry.

Multimedia technology offers unique benefits for chemistry courses when students are learning complex and new ideas. It plays a vital mediating role in helping students overcome many difficult and abstract concepts; and it appears to have potential benefits for integrating the classroom teaching, group study, and individual meaning making. This instructional strategy may have stimulated more student-student and teacher-student interactions in different levels of students' competence and performances. Therefore, to improve the outcomes of chemistry learning, chemistry teachers should enrich the learning environment as well as encourage students to actively participate in learning activities.

5.3.2 Effect of Gender on Achievement in Chemistry

There was no significant differential effect of gender on the achievement of students in chemistry. Therefore it may be said that there is no significant difference in the performance of boys and girls in terms of achievement in chemistry. This finding is supported by the findings of Demircioglu and Norman(1999), Dahindsa and Chung(2003), and Azizgolu(2004). In contrast Suneetha et al(2001), Hatice Belge Can(2012), Bambey et al. (2008), Chambers and Andre (1997) did find significant difference in the performance of boys and girls. However, the results of the present study indicate that the achievement in chemistry is independent of gender and depends on individual's cognitive development. Now-a-days, through media an attempt is made to promote the feeling of equality among boys and girls. Teachers as well as parents have no feelings of difference between boys and girls. Also, parents are aware about the importance of education so they are making efforts to educate their children

ignoring their income or profession. This change in attitude of parents and teachers might be the cause of the present finding.

5.3.3 Interaction of Treatment and Gender on Achievement in Chemistry

The interaction of treatment and gender did not produce a significant differential effect on the achievement of students in chemistry. The results showed that treatment had effect on the achievement of students in chemistry. The results also indicate that achievement in chemistry is independent of gender as discussed under caption 5.3.2. The results indicate that the mean achievement of experimental group was higher than the control group. Further, the mean achievement of girls was higher than the boys in both the groups. This shows that the effect of treatment on the achievement of students in chemistry is independent of gender. The achievement in chemistry depends on individual's cognitive development. Therefore, there might not be any significant differential effect of the interaction of treatment and gender on the achievement of students in chemistry.

5.4.0 EFFECT OF TREATMENT AND STYLE OF LEARNING AND THINKING AND THEIR INTERACTION ON ACHIEVEMENT IN CHEMISTRY

The discussions related to the effect and interaction of treatment and style of learning and thinking on the achievement of students in chemistry are presented in the caption 5.4.1, 5.4.2, 5.4.3.

5.4.1 Effect of Treatment on Achievement in Chemistry

Discussed under caption 5.3.1

5.4.2 Effect of Style of Learning and Thinking on Achievement in Chemistry

There was no significant differential effect of style of learning and thinking on the achievement of students in chemistry. Both the groups of learners i.e., students with left hemisphere brain dominance and right hemisphere brain dominance benefitted in the same way. This finding is supported by the findings of Yilmazsoylu and Akkoyunlu (2002) and Mary Lynne Wilson (2011) and is not supported by the findings of Uzuntiryaki (2007) and Vaishnav (2013).

5.4.3 Interaction of Treatment and Style of Learning and Thinking on Achievement in Chemistry

The interaction of treatment and style of learning and thinking did not produce a significant differential effect on the achievement of students in chemistry. The results showed that treatment had effect on the achievement of students in chemistry. The results also indicate that style of learning and thinking did not have any significant differential effect on the achievement of students in chemistry. Therefore, there might not be any significant differential effect of the interaction of treatment and style of learning and thinking on the achievement of students in chemistry.

5.5.0 EFFECT OF TREATMENT, PARENTAL PROFESSION AND THEIR INTERACTION ON ACHIEVEMENT IN CHEMISTRY

The discussions related to the effect and interaction of treatment and parental profession on the achievement of students in chemistry are presented in the caption 5.5.1, 5.5.2, 5.5.3.

5.5.1 Effect of Treatment on Achievement in Chemistry

Discussed under caption 5.3.1

5.5.2 Effect of Parental Profession on Achievement in Chemistry

There was no significant differential effect of parental profession on the achievement of students in chemistry. The achievement in chemistry is independent of parental profession and depends on individual's cognitive development. Due to Universalization of Elementary Education and Right to Education Act, all parents are sending their children to school irrespective of their profession. The result of the present study might be attributed to this factor.

5.5.3 Interaction of Treatment and Parental Profession on Achievement in Chemistry

The interaction of treatment and parental profession did not produce a significant differential effect on the achievement of students in chemistry. The results showed that treatment had effect on the achievement of students in chemistry. The results also indicate that achievement in chemistry is independent of parental profession as discussed under caption 5.5.2. Therefore, there might not be any significant differential effect of the interaction of treatment and parental profession on the achievement of students in chemistry.

5.6.0 EFFECT OF GENDER, PARENTAL PROFESSION AND THEIR INTERACTION ON ACHIEVEMENT IN CHEMISTRY

The discussions related to the effect and interaction of gender and parental profession on the achievement of students in chemistry are presented in the caption 5.6.1, 5.6.2, 5.6.3.

5.6.1 Effect of Gender on Achievement in Chemistry

Discussed under caption 5.3.2

5.6.2 Effect of Parental Profession on Achievement in Chemistry

Discussed under caption 5.5.2

5.6.3 Interaction of Gender and Parental Profession on Achievement in Chemistry

The interaction of gender and parental profession did not produce a significant differential effect on the achievement of students in chemistry. The achievement in chemistry is independent of parental profession and depends on individual's cognitive development. Now a days through media an attempt is made to promote the feeling of equality among boys and girls. Teachers as well as parents have no feelings of difference between boys and girls. Also parents are aware about the importance of education so they are making efforts to educate their children ignoring their income or profession. This change in attitude of parents and teachers might be the cause of the present finding.

5.7.0 SUMMARY

The summary of the present study is presented below, under different captions.

5.7.1 Rationale of the study

In recent years, there has been a wide spread support around the world for reforming science education in general and chemistry teaching in particular. Many researches in Europe and US suggest that many chemistry programmes all over the world and their related pedagogies are inadequate for sufficiently meeting the challenges.

Over the past twenty years, research in chemistry teaching has revealed that a vast majority of students at all levels learn chemistry by rote memorization. Although many students perform satisfactorily on exams, it has been found on interviewing students can reveal gross misconceptions regarding chemical phenomenon.

Hence, there is a need for instructors to rethink on the instructional strategy so that they can teach for meaning and not simple playback of chemical concepts. Hence, this study may help teachers and educational planners in making chemistry more meaningful and fun for learners.

5.7.2 Statement of the problem

The problem of the proposed study may be worded as:

“Effectiveness of Instructional Strategy for Teaching Chemistry to VII Standard”

5.7.3 Defining the Key Terms

- Instructional strategy- These are methods that are used in the lesson that the sequence or delivery of instructions helps students become independent strategic learners.
- Effectiveness- it refers to the improvement in student performance when the instructional strategies are used.

5.7.4 Objectives of the Study

1. To study the effectiveness of instructional strategy in terms of
 - a) Achievement of students in chemistry, and
 - b) Reaction of students towards the strategy.
2. To study the effect of treatment, gender and their interaction on the achievement in chemistry of class VII students, by taking their scores of intelligence as covariate.
3. To study the effect of treatment, style of learning and thinking and their interaction on achievement in chemistry of class VII students, by taking their scores of intelligence as covariate.
4. To study the effect of treatment, parental profession and their interaction on achievement in chemistry of class VII students, by taking their scores of intelligence as covariate.
5. To study the effect of gender, parental profession and their interaction on achievement in chemistry of class VII students, by taking their scores of intelligence as covariate.

5.7.5 Hypotheses

1. There is no significant effect of treatment on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate.
2. There is no significant effect of gender on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate.
3. There is no significant interaction of treatment and gender on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate.
4. There is no significant effect of style of learning and thinking on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate.
5. There is no significant interaction of treatment and style of learning and thinking on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate.
6. There is no significant effect of parental profession on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate.
7. There is no significant interaction of treatment and parental profession on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate.
8. There is no significant interaction of gender and parental profession on the achievement in chemistry of class VII students when their scores of intelligence were taken as covariate.

5.7.6 Methodology

In this study, Experimental method was employed for the study.

5.7.7 Design of the study

The design employed for this research work was Post-test Control Group Design.

5.7.8 Sample

In this study, the quasi-experimental design was used. The random assignment of already formed classes to experimental and control groups was employed to

examine treatment effect. The size of the sample was 50 students studying in VII standard of MSB Educational Institute, Bhopal.

5.7.9 Tools

- Style of Learning and Thinking developed by Dr. D. Venkatraman.
- Verbal Intelligence Test developed by Ojha and Ray Choudhary.
- The multimedia material from Edurite DigitALLY version 3.6.01 was used.
- Achievement Test in Chemistry
- The Reaction Scale

5.7.10 Procedure of Data Collection

The data was collected by administering the tools like, achievement test, reaction scale, intelligence test and style of learning and thinking. The experimental group was taught through the developed instructional strategy, while the control group was taught through the Lecture cum Demonstration Method. Ten lessons of 30 minutes each, related to the contents of the subject, were taught to both the groups. The Achievement test, Verbal Intelligence Test and Style of Learning and Thinking tool were administered to both the groups after completion of 10 lessons. The Reaction Scale was administered to the experimental group only.

5.7.11 Statistical Techniques used for the Analysis of Data

6. For studying the effectiveness of instructional strategy in terms of
 - a) Achievement of students in chemistry, and
 - b) Reaction of students towards the strategy, descriptive statistics was used.
7. For studying the effect of treatment, gender and their interaction on the achievement in chemistry ANCOVA of unequal cell size was used.
8. For studying the effect of treatment, learning style and their interaction on achievement in chemistry ANCOVA of unequal cell size was used.
9. For studying the effect of treatment, parental profession and their interaction on achievement in chemistry ANCOVA of unequal cell size was used.
10. For studying the effect of gender, parental profession and their interaction on achievement in chemistry ANCOVA of unequal cell size was used.

5.7.12 Findings

1. The developed instructional strategy was effective in terms of students' achievement in chemistry.
2. The developed instructional strategy was effective in terms of students' reactions towards the developed instructional strategy.
3. The treatment produced a significant differential effect on the achievement of students in chemistry.
4. Gender did not produce a significant differential effect on the achievement of students in chemistry.
5. The interaction of treatment and gender did not produce a significant differential effect on the achievement of students in chemistry.
6. There was no significant differential effect of style of learning and thinking on the achievement of students in chemistry.
7. The interaction of treatment and style of learning and thinking did not produce a significant differential effect on the achievement of students in chemistry.
8. There was no significant differential effect of parental profession on the achievement of students in chemistry.
9. The interaction of treatment and parental profession did not produce a significant differential effect on the achievement of students in chemistry.
10. The interaction of gender and parental profession did not produce a significant differential effect on the achievement of students in chemistry.

5.7.13 Delimitations of the Study

- The study is delimited to an English Medium, co-ed school of Bhopal only.
- The study is delimited to the subject of chemistry of class VII, only.
- The study is delimited to students of VII standard studying in ICSE Board.

5.7.14 Educational Implications

- Multimedia provides interaction between the learner and the subject matter.
- Multimedia provides immediate feedback to the students for better interaction and motivation.
- Various Textbooks can attach CDs related to the subject matter in chemistry.

- The curriculum developers should make the curriculum gender friendly at all stage.
- Parents should give equal importance to their child's educational needs irrespective of their ward's gender.
- Teachers should also give equality with respect to gender in the classroom as well as outside the classroom.
- Teachers should use more than one teaching style to cater to individual needs of the students, respecting their style of learning and thinking.
- The contents of textbooks of chemistry should be presented on CAM approach giving opportunities to the students to explore more examples. These examples should include the ones related to daily life.
- Teachers should use such instructional strategy for teaching of chemistry which gives students an opportunity to think independently.

5.7.15 Conclusion

The findings of the study reveal that the instructional strategy was effective in terms of achievement of students in chemistry and in terms of reactions of students towards the strategy. It produced a significant differential effect on achievement in chemistry when compared to the Lecture- cum-demonstration method. It was also found that achievement in chemistry is independent of gender, style of learning and thinking and parental profession.

5.7.16 Suggestions for Further Studies

There are some suggestions for further studies as follows:-

- The effectiveness of this instructional strategy used for teaching other topics of chemistry can be studied.
- The effectiveness of this instructional strategy can be studied for teaching other branches of science.
- The effectiveness of different instructional strategies can be studied for teaching chemistry at other stages.
- The effectiveness of different instructional strategies can be studied for other branches of science.

- The study can be replicated with a larger sample of students belonging to State & CBSE Board.
- A similar study can be conducted using different learning style inventories.
- The effectiveness of instructional strategy for teaching of chemistry can be studied with respect to change in attitude of students towards the subject.