Summary and Findings
<table>
<thead>
<tr>
<th>Contents</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAPTER V : SUMMARY AND FINDINGS</td>
<td>180 - 216</td>
</tr>
<tr>
<td>5.1. Introduction</td>
<td>180</td>
</tr>
<tr>
<td>5.2. a) Statement of the problem</td>
<td>181</td>
</tr>
<tr>
<td>b) Definition of key terms</td>
<td>182</td>
</tr>
<tr>
<td>5.3. Variables selected for the study</td>
<td>182</td>
</tr>
<tr>
<td>5.4. Need and Significance of the study</td>
<td>183</td>
</tr>
<tr>
<td>5.5. Scope and contribution of the Study</td>
<td>187</td>
</tr>
<tr>
<td>5.6. Objectives</td>
<td>188</td>
</tr>
<tr>
<td>5.7. Hypotheses</td>
<td>190</td>
</tr>
<tr>
<td>5.8. Sample</td>
<td>192</td>
</tr>
<tr>
<td>5.9. Methodology</td>
<td>193</td>
</tr>
<tr>
<td>5.10. Tools used</td>
<td>194</td>
</tr>
<tr>
<td>5.11. Statistical Techniques used</td>
<td>194</td>
</tr>
<tr>
<td>5.12. Abbreviations used</td>
<td>195</td>
</tr>
<tr>
<td>5.13. Findings of the study</td>
<td>196</td>
</tr>
<tr>
<td>5.14. Summary of the findings</td>
<td>209</td>
</tr>
<tr>
<td>1. General findings</td>
<td>209</td>
</tr>
<tr>
<td>2. Findings with special reference to UA</td>
<td>210</td>
</tr>
<tr>
<td>5.15. Recommendations</td>
<td>211</td>
</tr>
<tr>
<td>5.16. Suggestions for further research</td>
<td>214</td>
</tr>
<tr>
<td>5.17. Conclusion</td>
<td>216</td>
</tr>
</tbody>
</table>
CHAPTER V

SUMMARY AND FINDINGS

5.1. Introduction

Underachievement is a crucial problem that should be solved so as to enable the society to derive optimum benefit from the system of education. The contributing factors of underachievement should be located and should be reduced to the possible minimum and underachievers should be helped to utilise their potential in full. Otherwise underachievement will continue to obstruct the path towards progress and the talent and resources of the nation will be wasted.

According to Deo the identification of underachievers is not easy and is the reason for the slow progress of research on underachievement compared to the pace of research on average achievement. Hence more research efforts are needed in the area of underachievement.
Dhariwal and Saini reported that 44.91, 47.46, 48.31 and 50.85 percent of high school pupils are underachieving in English, Mathematics, Geography and Hindi respectively. This high percentage of UA shows that researches on the educational innovations should be done with special reference to underachievers to evolve suitable strategies to surmount the hitherto unyielding problem of underachievement.

Since CAI has been proved by many educationists to have the successful component of individualisation that takes into account the individual differences, research on CAI with special reference to underachievers is sure to result in some useful guidelines for the future. It was with this objective that the investigator tried to analyse the effectiveness of CAI with special reference to UA.

5.2.a) Statement of the problem

Effectiveness of Computer Assisted Instruction with special reference to Underachievers
b) Definition of key terms

i) Computer Assisted Instruction

It is an instructional technique where the computer program enables the computer to mediate the flows of information between the learner and the learning material in the learning process.

ii) Underachievers

If the actual achievement score of the learner is less than the predicted achievement score by one standard error of the predicted achievement score or more, he is an underachiever.

5.3. Variables selected for the study

The Treatment variable was the Teaching Technique, namely, i) CAI with Teacher Support System ii) CAI without Teacher Support System and iii) Traditional Teaching. Two types of CAI techniques - one with the teacher support system and the other without the teacher support system were given to Group I and Group II - the two experimental groups of the sample respectively. Group III - the control group was taught by traditional teaching.
The classification variables were: Sex, Locale, IQ, and Achievement Level of the students. The results were analysed with special reference to underachievers. The Study Habit and Mathematics Study Attitude of the under- and over-achievers were analysed to find out the interaction effect of the same on the experimental factor. Apart from the classification variables, the Study Habit & Maths Study Attitude of the students and Teacher Support System were also analysed.

5.4. Need and Significance of the study

Need for research on CAI to find a solution to solve the problem of underachievement has already given a background to the problem selected for investigation. Such research efforts are needed more in Mathematics learning since Mathematics is a subject which is under the strong influence of computers. Mathematics learning is seen to be influenced by computers in 2 ways: One is the way the low, average, and underachieving learners can learn the subject through computers without 'Mathophobia' or cheerlessness and second is the way the high and over-achievers can use it for enriched and more difficult learning tasks. Hence, it is found that in Maths instruction, a study on the
effectiveness of CAI with reference to different categories of learners is the need of the hour.

Most of the researchers who have analysed the effectiveness of CAI techniques on the maths achievement of the learners have done so with reference to the classification - high, average, and low achievers. In this conventional classification, the point of reference is the average score of the group or a standard norm. But, in an individualised instructional technique like CAI where the aim is to help the learners to progress according to their capabilities, we need a different set of parameters that takes into account the individual's capabilities. In this context, the classification - over-, normal-, and under-achievers which is based on whether a learner achieves in tune with his/her capabilities, will be a more sensitive one.

Researches (Purushothaman and Stella, 1990; Scofield, 1991; Stella, 1991) have proved that CAI does not lead to significant improvement in the achievement of high achievers. The investigator realised that such findings can not be used to evolve guidelines for individualised techniques due to the inappropriateness of the
classification - high, average and low to assess individualised techniques in terms of the high achievers' gain. In that classification the individual's optimum development is lost sight of and a high achiever has a small margin to progress (eg. from 90 to 100) where as the average and low achievers have a wider margin (eg. 55 to 100 & 30 to 100). Obviously most of the high achievers would be already nearing the maximum. Hence, it may not be meaningful to say that the high achievers do not benefit out of CAI. To come to meaningful generalisations about the effectiveness of individualised techniques we should try to answer the question "Does the strategy help the learner to reach his/her maximum?" This becomes possible if we consider the classification - UA, NA and OA.

Further analysis of the Indian Educational Researches reveals the following gaps in the present body of knowledge.

a. To derive optimum benefit from the system of education, every learner should be helped to reach his/her maximum level of attainment. But the researches so far undertaken in this area are meagre and inadequate.
b. Even those few studies undertaken so far have not analysed the effectiveness of CAI with reference to the optimum development of individual learners.

c. There is a dearth of clear-cut guidelines for the further trends and criteria for consideration in the matter of developing CAI material for maths learning.

d. Attempts to overcome the problem of underachievement in Mathematics at high school level through technological inputs with teacher support system are nil.

e. Experiments on "What type of learners will reach the optimum level of attainment through what type of instructional technique" are inadequate.

f. There are no substantial findings on the role of teachers in CAI under Indian condition.

g. The few studies that have analysed some of the above mentioned aspects have not effectively combined the variables viz. UA in Maths, CAI and the Teacher Support.

Hence, to throw more light on the above mentioned knowledge gaps, the investigator has undertaken this study.
5.5. Scope and contribution of the Study

i) The results of this study will throw more light on the means to surmount the problem of underachievement in mathematics at school level which will help us to evolve suitable strategies for computer utilisation in schools.

ii) The non-availability of quality software at a reasonable price and the lack of a sound learning theory behind the production of CAI software call for the involvement of subject teachers in the production arena. Experiments of this kind will encourage more teachers to produce their own software and modify according to the needs of the target group. It will also result in a better co-ordination between subject experts and computer experts and this will reduce the software gap.

iii) Packages of this kind are sure to impart dynamism into maths teaching and thus encourage more learners to remain in the stream and not give it up.

iv) Packages of this kind will save time or effort, or both, and hence will either save the institutions money, or enable the available staff to teach more pupils or handle more specialised courses.
v) The intellectual challenge created in the institution by such inputs will provide opportunities for a critical appraisal of the quality of education and result in more 'local experiments' on CAI applications.

vi) The 'local experiments' on the other hand will help the institutions and the teachers to become less dependent on the technology experts and hence reduce the strain of technology dependency.

In a nutshell, the outcome of this study will throw more light on CAI for underachievers and it will be beneficial to all those who are involved in the system of education - the learners, the teachers and the educational institutions.

5.6. Objectives

In the light of the variables selected for the study, the following objectives were framed:

1. To develop CAI software on the selected topic

2. To compare the effectiveness of CAI over the traditional method with reference to achievement level
3. To find out the effectiveness of the software with special reference to underachievers

4. To find out the impact of teacher support system on the achievement of the experimental group

5. To compare the impact of the two types of CAI on the achievement of the underachievers

6. To find out the relationship between the achievement level and the Sex of the experimental group

7. To find out the relationship between the achievement level and the Locale of the experimental group

8. To find out the relationship between the achievement level and the IQ of the experimental group

9. To find out the relationship between the achievement level and the Study Habit of the experimental group

10. To find out the relationship between the achievement level and Maths Study Attitude of the experimental group

11. To find out the interaction effect of Treatment & Sex on the achievement of the experimental group
12. To find out the interaction effect of Treatment & Locale on the achievement of the experimental group

13. To find out the interaction effect of Treatment & IQ on the achievement of the experimental group

14. To find out the interaction effect of Treatment & Study Habit on the achievement of the experimental group

15. To find out the interaction effect of Treatment & Maths Study Attitude on the achievement of the experimental group

16. To find out the interaction effect of Treatment & Achievement Level(UA-OA) on the achievement of the experimental group

5.7. Hypotheses

To reach the above objectives, the following null hypotheses were formulated:

1. There is no significant difference between the achievement of the experimental and the control groups.

2. There is no significant difference between the achievement of the two experimental groups due to teacher support system.
3. There is no significant difference in the achievement of the underachievers of the sample due to CAI.

4. There is no significant difference between the achievement of the underachievers due to teacher support system.

5. The achievement of the experimental group does not depend on the Sex of the students.

6. The achievement of the experimental group does not depend on the Locale of the students.

7. The achievement of the experimental group does not depend on the IQ of the students.

8. The achievement of the experimental group does not depend on the Study Habit of the students.

9. The achievement of the experimental group does not depend on the Maths Study Attitude of the students.

10. The achievement of the experimental group does not depend on the Achievement Level (OA-UA) of the students.

11. The interaction effect of Treatment & Sex on the achievement scores of the sample is not significant.
12. The interaction effect of Treatment & Locale on the achievement scores of the sample is not significant.

13. The interaction effect of Treatment & IQ on the achievement scores of the sample is not significant.

14. The interaction effect of Treatment and Study Habit on the achievement scores of the sample is not significant.

15. The interaction effect of Treatment and Maths Study Attitude on the achievement scores is not significant.

16. The interaction effect of Treatment & Achievement Level (OA-UA) on the achievement scores is not significant.

5.8. Sample

The randomised block design was followed in the selection of the sample. In such a sampling design, the sample is divided into blocks and items belonging to a particular block are allocated at random to the different groups. Since the identification of UA depends on the aptitude score, IQ was taken as the blocking variable.

The sample consisted of students of Std IX selected from 3 Tamilnadu State Board Schools - 1 rural & 2 urban.
From each school 35 Std IX students were selected. Using Farquhar's regression method, the selected students were classified into under-, normal- and over-achievers with respect to two different maths achievement scores. This double classification was done to eliminate the ambiguous cases. Students belonging to the same category in both the classifications alone were selected for the final study. Since IQ was the blocking variable, the size of each IQ block - high, average & low IQ category, was further reduced to the nearest multiple of 3 by the random rejection of a few cases. Students within IQ blocks were allocated at random to 3 groups and thus three groups of size 32 each were formed.

5.9. Methodology in Brief

The three random groups were assigned the three different treatments at random. Data on the student variables viz. Study Habit and Mathematics Study Attitude were collected before administering the treatment. The groups were tested for their achievement level at the end of the treatment and statistical techniques were applied to test the hypotheses framed for the study.
5.10. Tools Used

a) CAI software on "The Language of Sets" developed by the investigator in 1990

b) Achievement test on the selected topic developed by the investigator

c) Culture Fair Intelligence Test - Scale 2 - Form B designed by R B Cattell and A K S Cattell, 1961

d) Study Habits Inventory constructed and standardised by Dr. B.V. Patel

e) Mathematics Study Attitude Scale developed and standardised by Sundararajan and Srinivasan in 1990

5.11. Statistical Techniques used

a) Regression Analysis for identifying under-achievers

b) 't' test to analyse the differential hypothesis

c) X² analysis to test the relationship between variables

d) One way ANOVA to test the superiority of the experimental factor
e) Two-way ANOVA to find out the interaction effect of Treatment and the selected variables viz. Sex, Locale, IQ, Study Habit, Maths Study Attitude and Achievement Level (OA-UA) on the achievement scores of the sample.

f) Graphical analysis to find out the interaction effect of the CAI strategy and the variables viz. Sex, Locale, IQ, Study Habit, Maths Study Attitude and Achievement Level (OA-UA).

5.12. Abbreviations used

UA - Underachiever
NA - Normalachiever
OA - Overachiever
TSS - Teacher Support System
CAI - Computer Assisted Instruction
5.13. Findings of the study

**Hypothesis 1:**

There is no significant difference between the achievement of the experimental & the control groups.

Statistical technique used : One-way ANOVA
F-ratio : 7.21   Level of significance : 1%
Null Hypothesis is rejected.

The differential analysis followed the ANOVA.
Groups compared : CAT with TSS & Traditional
T-value : 16.12   Level of significance : 1%
Null Hypothesis is rejected.

T-test for CAT without TSS & Traditional
T-value : 14.90   Level of significance : 1%
Null Hypothesis is rejected.

The ANOVA confirms the significant difference in the mean scores of the three groups. The differential analysis proves that CAT with Teacher Support System leads to significantly different achievement compared to the Traditional Method of instruction. The higher mean scores of the CAI group reveals that the CAT with TSS is superior to the Traditional method of instruction.
Similarly, the t-test also shows that CAI without Teacher Support System leads to significantly different achievement compared to the Traditional Method of instruction and the higher mean scores of the CAI without TSS group establishes the superiority of the experimental factor over the traditional method.

Putting the results of both the above mentioned differential analysis together we find that both the experimental groups - CAI with Teacher Support System and CAI without Teacher Support System, have scored significantly higher than the control group that received instruction through Traditional method. This leads to the conclusion that both the CAI strategies are beneficial to the learners to help them achieve higher.
Hypothesis 2:
There is no significant difference between the achievement of the two experimental groups due to teacher support system.

Statistical technique used: t-test
Groups compared: CAT with TSS and CAT without TSS
t-value: 1.22 Not significant
Null Hypothesis accepted.

The above analysis indicates that both the CAT groups have performed equally well irrespective of the factor whether TSS was given or not. Hence we can say that Teacher Support for CAT does not lead to differential achievement of the groups. However the slightly higher mean score of the CAT with TSS group than the CAT without TSS group implies that Teacher Support is not detrimental to individualised learning through CAT, rather it facilitates better learning, though the difference is not statistically significant.

The results of Hypothesis 1 and Hypothesis 2 reveal that both the CAI strategies viz. CAI with TSS and CAI without TSS are superior over the Traditional method of instruction. But the CAI strategies do not differ from each other significantly in their effect on pupils' achievement.
Hypothesis 3:

There is no significant difference in the achievement of the underachievers of the sample due to CAI.

Statistical technique: t-test

Groups compared: UA of CAI with TSS & Traditional
t-value: 8.81 Level of significance: 1%
Null Hypothesis is rejected.

Groups compared: UA of CAI without TSS & Traditional
t-value: 11.13 Level of significance: 1%
Null Hypothesis is rejected.

The above analysis indicates that CAI with TSS does lead to differential achievement of the underachievers facilitating higher achievement than the Traditional Method. Similarly, the t-test also reveals that CAI without TSS does lead to better achievement of the underachievers than the Traditional Method.

Putting the results of both the above mentioned analysis together, we conclude that the UA gain higher scores due to both the CAI strategies viz. CAI with TSS and CAI without TSS than the Traditional Method.

However, a comparison between the two CAI strategies with TSS and without TSS helps to understand the above finding in a better perspective.
Hypothesis 4:

There is no significant difference between the achievement of the underachievers due to teacher support system.

Statistical technique: t-test
Groups compared: UA of both the CAI groups
t-value: 2.10 Level of significance: 5%
Null hypothesis rejected.

The above analysis indicates that CAI with teacher support system is more beneficial to the underachievers. Hence we can say that Teacher Support System for CAI does lead to differential achievement of the underachievers and it facilitates better achievement of the underachievers.

The results of Hypotheses 3 and 4 reveal that both the CAI methods viz. CAI with TSS and without TSS are superior than the Traditional method in enabling underachievers to achieve higher and CAI with TSS is still more effective than CAI without TSS in improving their achievement score.
Hypothesis 5:

The achievement of the experimental group does not depend on the Sex of the students.

From the $X$ analysis it is found that the variable Sex does not have any significant relation with the achievement score at both the entry and terminal levels. Hence we conclude that the achievement of the experimental group does not depend on the Sex of the sample.

Hypothesis 6:

The achievement of the experimental group does not depend on the Locale of the students.

The $X$ analysis shows that the variable Locale does not have any significant relation with the achievement score at both the entry and terminal levels. Hence we conclude that the achievement of the experimental group does not depend on the Locale of the students.
Hypothesis 7:

The achievement of the experimental group does not depend on the IQ of the students.

The analysis shows that the relationship between IQ level and achievement score is significant at 1% level of significance at the entry level. This significant difference is not found at the terminal level which indicates that the experimental factor has helped the learners to overcome the significant association between IQ and achievement. Hence in the light of the increase in the mean scores of the low IQ group we conclude that the experimental strategy (CAI) has resulted in enabling the students of the lower cadre, namely low and average IQ learners, to break away the significant dependence on IQ to achieve higher.

Hypothesis 8:

The achievement of the experimental group does not depend on the Study Habit of the students.

The relationship between Study Habits and achievement score has been proved to be significant at 5% level of significance at the entry level. This significant
difference is not found at the terminal level which indicates that the experimental factor has helped the learners to overcome the significant association between Study Habits and achievement. The increase in the mean scores of the low groups reveal that the experimental factor has facilitated better achievement. Hence we conclude that the experimental strategy (CAI) has resulted in enabling the students of the lower cadre, namely students with poor Study Habits, to overcome the influence of poor study habit on their higher achievement.

Hypothesis 9:

The achievement of the experimental group does not depend on the Maths Study Attitude of the students.

The relationship between Maths Study Attitude and achievement score has been proved to be significant at 5% level of significance at the entry level. This significant difference is not found at the terminal level which indicates that the experimental factor has helped the learners to overcome the significant association between Maths Study Attitude and achievement. The increase in the mean scores of the low groups reveal that the experimental factor has facilitated better achievement.
Hence we conclude that the experimental strategy (CAI) has resulted in enabling the students of the lower cadre, namely students with unfavourable maths study attitude, to achieve higher.

**Hypothesis 10:**

The achievement of the experimental group does not depend on the Achievement Level (OA-UA) of the students.  

The X analysis shows that the variable Achievement level does not have any significant relation with the achievement score at both the entry and terminal levels. Hence we conclude that the achievement of the experimental group due to the treatment with CAI, does not depend on their original Achievement level (OA-UA) of the students.

The results of Hypothesis 6 to 10 reveal that there is no relationship between the post-treatment scores and the variables Sex, Locale and Achievement Level (OA-UA) of the experimental group. In the case of the variables TQ, study Habit and Maths Study Attitude, the positive relationship between those variables and achievement at the pre-treatment level has been found to be cancelled at the post-treatment level. Since this is due to the CAI treatment.
which has enabled the lower strata learners viz. learners with low IQ, unfavourable maths study attitude and poor Study Habits to improve their scores, we conclude that CAI strategies are beneficial to learners of the lower strata with reference to IQ, Study Habit and Maths Study Attitude to achieve high.

Hypothesis 11:

The interaction effect of Treatment & Sex on the achievement scores of the sample is not significant.

Statistical technique: Two-way ANOVA
F-ratio for Treatment: 82.71 p < .01
F-ratio for Sexes: 0.96 p > .01
F-ratio for Interaction: 1.21 p > .01

The two-way ANOVA indicated that the interaction effect of Treatment & Sex is not significant on the post-treatment scores.
Hypothesis 12:
The interaction effect of Treatment & Locale on the achievement scores of the sample is not significant.

Statistical technique: Two-way ANOVA
F-ratio for Treatment: 55.77 p < .01
F-ratio for Locale: 1.13 p > .01
F-ratio for Interaction: 0.93 p > .01

We conclude that there is no significant difference due to the interaction of Treatment & Locale on the achievement scores even at 5% level of confidence.

Hypothesis 13:
The interaction effect of Treatment & IQ on the achievement scores of the sample is not significant.

Statistical technique: Two-way ANOVA
F-ratio for Treatment: 58.75 p < .01
F-ratio for IQ Level: 2.13 p > .01
F-ratio for Interaction: 1.09 p > .01

We conclude that there is no significant difference due to the interaction of Treatment & IQ level on the achievement scores even at 5% level of confidence.
Hypothesis 14:

The interaction effect of Treatment and Study Habit on the achievement scores of the sample is not significant.

Statistical technique: Two-way ANOVA

F-ratio for Treatment: 55.60 p < .01
F-ratio for Study Habit: 1.85 p > .01
F-ratio for Interaction: 1.38 p > .01

We conclude that there is no significant difference due to the interaction of Treatment & Study Habits on the achievement scores even at 5% level of confidence.

Hypothesis 15:

The interaction effect of Treatment and Maths Study Attitude on the achievement scores is not significant.

Statistical technique: Two-way ANOVA

F-ratio for Treatment: 80.17 p < .01
F-ratio for Attitude: 2.12 & for Interaction: 2.13 p > .01

We conclude that there is no significant difference due to the interaction of Treatment & Attitude on the achievement scores even at 5% level of confidence.
Hypothesis 16:

The interaction effect of Treatment & Achievement Level (OA-UA) on the achievement scores is not significant.

Statistical technique: Two-way ANOVA

F-ratio for Treatment: 65.36 p < .01
F-ratio for Achievement level: 4.0 p < .05
F-ratio for Interaction: 4.43 p < .05

We conclude that there is significant difference due to the interaction of Treatment & UA-OA on the achievement scores at 5% level of significance.

The results of all the above six Two-way ANOVA reveal that except Achievement Level (OA-UA) all the other variables viz. Sex, Locale, IQ, Study Habit and Maths Study Attitude while combined with the experimental factor viz. CAI strategy have no interaction effect on the post-treatment score. In the case of Achievement Level (OA-UA) alone there is interaction where the underachievers benefit more out of the CAI than even the overachievers.

Interaction Analysis with reference to CAI with TSS

The interaction between the experimental factor CAI with Teacher Support System and the other variables were
studied with the help of the interaction lines. It was found that the lines intersect only for the variables UA-OA and CAI indicating interaction between achievement level and CAI.

5.14. Summary of the findings

5.14.1. General Findings

Both the CAT strategies viz. CAT with Teacher Support System and CAT without Teacher Support System are superior over the Traditional method of instruction. But the CAT strategies do not differ from each other significantly in their effect on pupils' achievement.

There is no relationship between the post-treatment scores and the variables Sex and Locale of the experimental group. In the case of the variables IQ, study Habit and Maths Study Attitude, the positive relationship between those variables and achievement at the pre-treatment level has been found to be cancelled at the post-treatment level. Since this is due to the CAT treatment which has enabled the lower strata learners viz. learners with low IQ, unfavourable maths study attitude and poor study Habits to improve their scores, we conclude that CAT strategies are
beneficial to learners of the lower strata with reference to IQ, Study Habit and Maths Study Attitude to achieve high.

Sex, Locale, IQ, Study Habit and Maths Study Attitude while combined with the experimental factor viz. CAI strategy have no interaction effect on the post-treatment score.

5.14.2. Findings with special reference to UA

Both the CAT strategies viz. CAT with Teacher Support System and without Teacher Support System are superior than the Traditional method in enabling underachievers to achieve higher and CAT with Teacher Support System is still more effective than CAT without Teacher Support System in improving their achievement score.

The post-treatment scores of the CAT groups do not depend on the original UA-OA Achievement Level.

The interaction of Achievement Level (OA-UA) and Treatment is significant where the underachievers benefit more out of the CAI than even the overachievers.
The interaction between the experimental factor CAT with Teacher Support System and the other variables were studied with the help of the interaction lines. It was found that the interaction lines intersect only for the variables UA-OA and CAT indicating interaction between achievement level and CAT.

5.15. Recommendations

1. Since the underachievers of the CAT groups have been found to benefit more out of CAT than even the overachievers the schools should try to implement suitable strategies in choosing the instructional methods which would enable the UA to reach their optimum level.

2. Whenever necessary, Teacher Support System may be added/extended to the CAT in the case of the underachievers since the study has proved the significant gain of the underachievers due to Teacher Support System.

3. Teacher effectiveness is an important criterion that affects the successful implementation of the teacher support system. Since the study
has proved the significant impact of Teacher Support System on the underachievers, the teachers should be adequately trained to play a supportive role leading the learners towards optimum level of attainment.

4. Attitude Tests may be administered on the learners to identify those with unfavourable attitude and the CAI may be tried upon them more widely in order to confirm the positive influence of the CAI on their achievement as shown from the findings of this study.

5. CAI may further be used for those with poor study habits since the study has shown a favourable result.

6. CAI may be used to help those with low & average I.Q. since the study has proved the effectiveness of CAI to help them achieve high.

7. It is distinctly realised that, serious attempts have to be undertaken in all our schools to identify the underachievers and CAI may be followed as the strategy of instruction,
atleast in Maths, so that they can be helped to overcome underachievement.

8. CAT may be tried widely in our schools as a strategy, for all category of learners - UA, OA and NA, for teaching/learning maths either with or without Teacher Support System since both have been found to be more beneficial to learners.

9. Teacher Support System need not be taken as a detrimental factor to the effectiveness of individualised techniques since the study has proved that it leads to slightly higher mean scores even for over- and normal-achievers.

10. At the same time, Teacher Support System need not be stressed with reference to CAT for NA and OA as it does not lead to significantly differential achievement of NA and OA.

11. To enable learners benefit more out of CAT, wherever possible CAT has to be incorporated into the regular curriculum.
5.16. Suggestions for further research

* The relationship between some more inter-related factors like computer aptitude, computer literacy, attitude towards computer, and the pupils' achievement is an area of educational significance for research.

* A few other personality variables of the learners like Independence Vs Autonomy, Introvert Vs Extrovert can be researched into.

* The rigidity in fixing the mastery level criteria as 80% for all type of learners can be relaxed in the case of specific learner variables. CAT packages with an option for the learners to fix their mastery level criteria can be analysed for their effectiveness.

* Co-operative and small group learning through computers can be tried on experimental groups to evolve guidelines for Indian Schools, to compare the results with the findings of this study.

* The psychological aspects of the learners like warmth, the feeling of withness, recognition,
motivation etc., can be analysed for learners of various achievement levels.

* Effectiveness of CAT on the cognitive abilities can be analysed in depth.

* Effects of CAT may be tested for learners with low & average T.Q.

* CAT software on other topics in mathematics can be developed and experimented for their effectiveness.

* Effectiveness of CAT in various other disciplines can be analysed.

* The various factors that affect the success of CAT can be studied.

* The present study is an experimental study involving Tamilnadu State Board Schools. A similar study can be experimented on other type of schools.

* Since it is found that learning through CAT helps to overcome the effect of unfavourable attitude
towards maths on the achievement score large-sized samples can be tried and tested for further proof.

5.17. Conclusion

CAI is found to be effective on the achievement of learners with special reference to underachievers. The Teacher Support System is also found to have a favourable influence over the CAI strategies particularly in the case of underachievers. In Indian class-rooms, it is difficult to highly individualise learning due to their big size. If our teachers can be trained suitably to play an effective role in TSS, CAI as a strategy can effectively influence the learning among underachievers. Among the underachievers some of the better groups can be given CAI without TSS also. Ultimately CAI either with or without TSS can be an effective mode/strategy in the case of underachievers is what is proved by the findings of the study.

********

216