7.1 Introduction

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7.1 Introduction:

This chapter happens to be the last one but an important one since it deals with significant aspects of the present project. It includes the brief resume of the previous chapters. It includes general observations made during the conduction of the experiment. It discusses the major findings in the context of the previous researches done in the field. It discusses the major findings of the experiment controlling the concomitant variables. It also presents some of the prospective topics to be taken up in the light of the present research work.
7.2 Brief Summary:

In chapter I many important aspects related to the process of learning the subjects like learning which is purely informative subject. If the person learns the subject of his own he could do as well. For this the educational technology of Programme learning could be much help to them. There are many studies conducted on Programme learning vs traditional studies and it has been found more often than not that Programme learning is far superior to the traditional one.

But there are a few studies conducted to try out different types of Programmes and their relative effectiveness. The present chapter discusses the relative significance of such studies.

The second chapter deals with the theoretical aspects of the Programme learning. It discusses how the Programme learning could be used as a teaching-learning technology for making learners more independent.

The third chapter presents a review of the researches done in the field of the present one.
These researches have been discussed in the light of their objectives, general and special methodology used and the findings and the limitations of the studies. It also discusses the significance of these studies to help the researcher to conduct his present study effectively to come to the reliable and valid findings.

The chapter four discusses how the programmes were prepared and descriptions of the concomitant variables and their probable impact on the learning of cognitive subjects.

Chapter V deals with the planning of the experiment. Along with experiments how other test measuring the magnitude of concomitant variables were administered. Scoring works of the pre-test, post-test and that of concomitant variables were discussed, how they are reported and interpreted.

Chapter VI deals with the analysis of the data collected with the help of measuring instruments. The data were organised in the light of testing the null hypothesis of experiment presented in chapter V. After the main analysis, the analysis of the experimental data in the light of controlling and independent
variables was carried out effectively.

7.3 Observations:

1. Some of the students were inquiring about the PLM before conduction of the experiment.

2. Some teachers and students who were found reluctant to cooperate were explained about the experiment and made to cooperate.

3. The teachers who read the programmes were very happy and the reacted that such programmes could make students learn of their own.

4. After the administrations of the programmes the students were found very happy and were found very much cooperative to take up criterion test.

5. Some of the cooperative type teachers showed their willingness to learn how to administer such programmes to the students.

6. After taking criterion test the students wanted to know their scores on the initial test and criterion test because they wanted to compare
their achievements.

7. Some of the students who were found apparently clever could take up the programme more speedily.

8. Some of the students who were found more anxious were trying to move the strip to read the answer in a Linear programme.

9. Some of the students who were found apparently poor in reading found bored in pursuit of Branching programme.

10. The headmasters and the teachers went through both types of programmes and opined that Branching programmes are much more useful than the Linear ones.

11. Some of the teachers and headmasters were of the opinion that in a Linear programme answers must be given on a separate page since some of students were tempted to know the answer before try out the frame.

12. Some students reacted that such programmes are more interesting than the traditional one.
13. Some teachers indicated that such programmes could induce the learners to study of their own and keep them engage.

14. They also opined that such programmes may be very helpful in eliminating the indiscipline from the class.

15. In the beginning the school authorities were found reluctant for such projects but at the end seeing the effect of the experiment they change their attitude. And inquired about some more programmes on the other topics of commerce curriculum.

On the whole right from the beginning of early visits to schools to the final administration of the criterion test, the school authorities, teachers, students and peons were found very cooperative, and whole atmosphere remained quite encouraging.

The experimental programme was carried out on nine schools, these schools were not divided into urban and rural groups since higher secondary schools have floating students population. In the experimental
work equal number of sex groups are taken up in order to maintain the exact balance. These schools extended all possible help to carry out the experiment successfully. The separate rooms were provided for the Linear and Branching groups and also some teachers were assigned to assist in distribution of programme learning material and collection of it at the end of each sitting. There were eight such sittings for each type of programmes. They also extended all possible help in administration of entering behaviour (initial) test and criterion (final) test. In short the entire work of experimentation ran smoothly.

7.4 Major Findings of the Experiments and Studies Controlling Concomitant Variables:

This section presents the major findings of the experiment in detail. The findings are related to the criterion variable, achievement in Transport and Banking Commercial Services, Controlling pre-achievement in these commercial services and other concomitant variables.

The socio-psycho variables were as follows:
1. SES
2. Social Maturity
3. I.Q.
4. Emotional Stability
5. Suggestibility
6. Self-dependency
7. Radicalism
8. Social Adjustment
9. Vocational Adjustment
10. Educational Adjustment
11. Personal Adjustment
12. Family Adjustment
13. Sex

Since sex is truly dichotomous variables and not possible to get it measured in scores, it was decided to take it up as an independent variable. The rest of the variables are possible to be measured in scores and not truly dichotomous they were taken up as control variables.

For measurement of Pre-achievement and criterion achievement two separate tests were used, which are presented in appendix A and B. For measurement of control variables standardised tools were used. The analysis of the data was carried out with the help of sophisticated statistical technique like
ANCOVA to control errors committed in matching.
The studies are in three major divisions like the main experiment, comparing Linear and Branching PLM controlling the Pre-learning; the second experiment controlling Psycho-socio factors; Experiment in the context of Sex, independent variables.

The findings in detail are as follows:

"A Comparative Study of Achievement of Linear and Branching Programmes on Commercial Services Controlling Pre-Achievement."

The obtained F ratio of the study is 7.91 which exceeds comfortably the table value of F at .01 significant level. Hence the difference is significant. The null hypothesis 6.1 is not accepted. Consequently there is significant difference in achievement of commercial services between two groups namely Linear and Branching. The adjusted mean difference of .62 is in favour of Branching PLM. The error in forming identical groups on the basis of highly correlated control variable is corrected with the help of correction term \( t = .06573 \). As it is discussed ANCOVA is the most advisable technique to be used in such comparative experimental studies, consequently
it is concluded that the Branching PLM produces better results than the Linear PLM. The major findings of the studies conducted by others and reviewed by the researcher also corroborate the finding of the present one.

They are mentioned below for further clarification:

Krishna Murthy (1972) in his study about efficiency of different types of form of PLM established that Branching form was more efficient form for longer retention of the learnt material.

Kulkarni and Yadav, (1966) in their study conducted to compare relative efficiency of Linear and Branching programming could retain the null hypothesis. Consequently there was no significant difference between the two major types of programming.

Verma, G.S. (1977) in one of his important studies could find out that Branching Programme was more effective to Linear programme. It is interesting to note that Linear was found more effective so far the knowledge level is concerned whereas at comprehension level Branching was more efficient than the Linear one.
Mohammed Hussain (1974) in his study comparing Linear and Branching under supervised and non-supervised condition found that Branching non-supervised was found to be significantly better than Linear non-supervised.

**Study-1** A Study of Effectiveness of Linear and Branching Programmes controlling Pre-testing and SES

As discussed earlier Pre-achievement in the subject has strong relationship with criterion learning.

It is found more often that SES is positively related with the achievement in school subjects. Hence in the present study this effect was fully controlled by a meticulously matched groups on SES and pre-testing controlled variables. The ANCOVA statistical technique was used for this. The F ratio of the study is 3.89 (table 6.10) which is equal to the table value of F at .05 level of significance. Hence there is significant difference between the achievement of Branching group and Linear group. The error in matching the groups was controlled within the limit of random variation. The difference between adjusted means of two groups is in favour of group
which took Branching PLM. Hence it is concluded that Branching PLM Technique is superior to the Linear PLM Technique.

Study-2 A Study of Effectiveness of Linear and Branching Programmes Controlling Pre-testing and Social Maturity

The control variables are pre-testing and Social maturity. Pre-testing is strongly related with the criterion achievement. The other control variable is Social maturity. It is also presumed that the major ingredients of S.M. are closely related with the learning capacity of the learner. Hence the students having high S.M., are prone to achieve higher in their study achievement. Consequently thinking that this variable may function as a concomitant variable, it has been included in the study as a control variable. The Linear and Branching groups were fully matched with these two control variables. The error in matching was corrected with the help of the ANCOVA Statistical Technique. The obtained F ratio 3.95 (table 6.13) which is slightly more than the table value of F at .05 level of significance. Hence the null hypothesis was rejected and mean achievement of two groups were considered to be significantly
unequal. The adjusted mean difference is in favour of the group studied Branching Programme. Hence it is concluded that of the two Programmes the Branching programme is superior to that of Linear one.

**Study-3**  
A Study of Effectiveness of Linear and Branching Programme Controlling Pre-testing and I.Q.

In the present study pre-testing and IQ are two main controlling variables. The relationship of pre-testing in criterion learning is significantly established. The relationship between IQ and learning is established fact. In order to control their effect the researcher included them in the present study. The students of both the groups fully matched on these two controlled variables, by using ANCOVA Statistical Technique. The correction term for it was quite negligible. The obtained F ratio is 13.39 (table 6.16) which exceeds comfortably the table value of F at .01 level of significance. Hence the null hypothesis was rejected, and the difference in achievement adjusted means of commercial topics of the two groups was highly significant. Hence it is concluded that the students studied Branching Prog-
adjusted means is significant in favour of Branching group. Consequently the null hypothesis of the study was rejected. Hence it is concluded that of the two groups, the group which studied the Branching Material is found better in achievement on Transport and Banking services.

**Study-5**  
A Study of Effectiveness of Linear and Branching Programmes Controlling Pre-testing and Suggestibility.

In the present study pre-testing and suggestibility are two control variables. Pre-testing is strongly correlated with the criterion achievement. Suggestibility trait plays a negative role in independent learning. If learning is fully controlled and guided it has its own merit. The present study is neither of independent nor of guided learning, it is a kind of supervised study. However it is presumed that it may have its say in criterion learning. Hence the researcher included this variable as a control variable alongwith pre-testing. The groups were matched on these two control variables and randomly assigned treatments. The error committed in matching the groups was controlled with the help of ANCOVA.
Statistical Technique. The obtained F ratio is 4.52 (table 6.22) which exceeds the table value of F at .05 level of significance (table 6.22). Hence the difference in achievement between two groups is significant. The null hypothesis is not accepted. The adjusted mean difference is in favour of the group of students who studied the Branching Programme on commercial services of the project.

Study-6 A Study of Effectiveness of Linear and Branching Programmes Controlling Pre-testing and Self dependency Personality Trait.

In the present study, there are two control variables. Pre-testing is positively correlated with the criterion achievement. The self-dependency personality trait is presumed to be closely associated with independent learning, or auto-learning. Programme learning is a kind of auto-learning. Hence it is presumed that self-dependency trait may be related with the auto-learning through the PLM. Hence it is taken up as a control variable. Two groups were matched with help of control variables of the present study and were assigned to the Linear and Branching treatment. Whatever little errors committed in matching the groups was controlled by ANCOVA.
Statistical Technique. The obtained F ratio between groups is of 5.15 (Table 6.25) which exceeds the table value of F at .05 level of significance. (Table 6.25). Hence there is the significance difference between adjusted means of two groups. The null hypothesis is rejected. The difference is significant in favour of Branching group. Hence it is concluded that the students who read the Branching programme are found significantly superior to the group of students who studied the Linear programme. Hence it is specifically concluded that the Branching Programme is superior to the Linear programme.

Study-7 A Study of Effectiveness of Linear and Branching Programmes Controlling Pre-testing and Radicalism.

In this study there are two control variables namely pre-testing and Radicalism Personality Trait. Pre-testing is strongly associated with the criterion achievement. Radicalism personality trait has its effect on breaking the tradition. Programme Learning technique is much divorced from the traditional learning. Hence it is presumed that the learners who are more radical, could benefitted by PLM. Whereas
who are conservative would be at loss. In short this variable has its effect as control variable on criterion achievement. Hence the researcher has taken up these two variables as control variables. Two groups were matched on these control variables and randomly assigned them to the different programme learning technique. The obtained $F$ ratio is of 5.087 (table 6.28) which exceeds table value of $F$ at .05 level of significance. (table 6.28) Hence the null hypothesis of the study is rejected. Hence the difference between two adjusted means of these groups is significantly in favour of Branching group. (table 6.26). Consequently it is inferred that the students who read the Branching Programme are found superior to their counterparts i.e. students who read Linear Programme.

Study-8 A Study of Effectiveness of Linear and Branching Programmes Controlling Pre-testing and Social Adjustment.

In the present study, there are two control variables namely pre-testing and Social adjustment. Pre-testing is strongly correlated with the criterion achievement. The Social adjustment is presumed to
related with criterion achievement as if a person is socially well adjusted he would learn the material peacefully and would be able to concentrate on his studies. And if he is socially mal-adjusted he would not be able to concentrate on his learning plan. Hence it appears positively that it is associated with the criterion achievement. The groups were matched on these controlling variables and randomly assigned to the treatments. Whatever little error committed in matching the groups was controlled by using ANCOVA Statistical Technique. The obtained F ratio of 5.25 (table 6.31) exceeds the table value of F at .05 level of significance. The null hypothesis is rejected. Consequently the difference between adjusted means of two groups is significant. It is in favour of Branching group (table 6.29). Hence it is concluded that the group taken the treatment of Branching programme is superior to the group taken Linear programme. Hence it is concluded that the Branching Programme is superior to the Linear Programme.
In the present study there are two control variables namely Pre-testing and Vocational Adjustment. Pre-testing is positively related with the criterion achievements. The vocational adjustment is presumed to be associated with commercial subjects. The students who are vocationally adjusted would read the topics on commercial services like Transport and Banking. Consequently vocational adjustment is taken up as a control variable alongwith pre-testing. Experimental two groups were matched on these control variables. Then the groups were assigned to the treatments randomly. To control any error committed in matching the groups ANCOVA was used. The obtained F value of F is 2.44 which does not reach to the table value of F even at .05 level of significance (table 6.34). Hence the null value is accepted. The difference between the adjusted means is not significant. Both the groups are equal. Hence it is concluded that the Linear and Branching programmes are not significantly different. Hence they are equally effective but not different in effectiveness.
In the present study, there are two control variables namely the Pre-testing and Educational Adjustment. Pre-testing is significantly positively related with the criterion achievement. The educational adjustment from its ingredient appears to be associated with the criterion achievement. Hence they are used as control variables. The two groups were matched on these two control variables and they were assigned to the treatments randomly. The error committed in matching the groups was controlled by the use of ANCOVA Statistical technique. The obtained value of F is of 2.062 which does not reach to the table value of F even at .05 level of significance (table 6.37). Hence the null hypothesis of this study is accepted. The mean difference between the adjusted means is not significant (table 6.35). Hence both the groups are equal. Consequently it is inferred that the two groups of students taken two different treatments are just equal, so Linear and Branching programmes are found equal.
In the present study attempt has been made to use pre-testing and personal adjustment as control variables to match two groups to be assigned to Linear and Branching programmes treatment randomly. Pre-testing is closely associated with the criterion achievement. It was assumed that the personal adjustment is associated with the criterion achievement. Since the ingredients described in personal adjustment seems to be associated with the criterion achievement. To control the errors in matching the groups ANCOVA Statistical technique was adopted. The obtained F ratio of 2.29 does not reach the table value of F at .05 level of significance (table 6.40). Hence the null hypothesis of the study is accepted. The difference between the adjusted means of Linear and Branching groups is not significant. Hence it is concluded that both the programmes are on par in enabling the learners to learn about commercial services like Transport and Banking.
The attempt has been made to study match two groups assigned to two different programme learning treatments namely Linear and Branching on two control variables, such as Pre-testing and familiar adjustment. The Pre-testing as a control variable is a positively associated with the criterion achievement. The familiar adjustment is assumed as correlated with the criterion achievement as the ingredients of the variable appear to related with the criterion achievement. In matching the groups, whatever little error committed is controlled by the use of ANCOVA Statistical technique. The obtained F ratio of 5.56 exceeds the table value of F at .05 level of significance (table 6.45). Hence there is difference between adjusted means of Linear and Branching groups. Consequently the null hypothesis is rejected. Hence it is concluded that the students of two groups differ significantly in their criterion achievement. The mean difference is in favour of the Branching group (table 6.41). Consequently the
Branching programme is more effective than the linear one.

Study-13  A Study of Effect of Sex on Linear Programming Controlling Pre-achievement.

In the present study sex was taken up as an independent variable and pre-achievement was taken up as a controlling variable. The students reading Linear programming material were divided into two groups on the base of Sex. These groups were matched on pre-achievement in commercial services like Transport and Banking. There were equal number of observations for both sexes. The error in matching was controlled by the use of ANCOVA Statistical Technique. The obtained F ratio is of 7.09 which exceeds comfortably the table value of F at .01 level of significance (table 6.46). The difference between two adjusted means is significantly in favour of the girl group. (table 6.44). Hence the null hypothesis of the study is rejected. Consequently it is concluded that the independent variable functions as a significantly effective variable on Linear progra-
mning material. Hence it could be further concluded that the girls gain significantly more achievement in commercial services like Transport and Banking than the boys.

**Study-14** A Study of Effect of Sex on Branching Programming Controlling Pre-testing (Pre-achievement).

In the present study sex was taken up as an independent variable and pre-testing or pre-achievement as a control variable. Two groups matched on pre-achievement based on pre-achievement scores on pre-testing were given the Branching Programme on commercial services like Transport and Banking. The Errors committed in matching the groups were controlled with the help of ANCOVA Statistical technique. The obtained F ratio is 3.01 which does not reach up to the table value of F at .05 level of significance (table 6.49). Hence the difference between the two adjusted means is not significant. Consequently the null hypothesis is accepted and the main effect of sex is not significant. Hence it is inferred that the matched groups on pre-testing do not indicate any
difference in the achievement of the commercial services like Transport and Banking studied through the Branching programming. Hence it is further concluded that sex does exert any influence in learning through Branching programming.

Study-15 A Study of Linear and Branching Programming controlling male Sex and Pre-achievement.

In the present study sex and pre-achievement were taken up as control variables. All the male subjects divided into two groups were matched on Pre-achievement in commercial services like Transport and Banking on scores of Pre-testing. As students in both the groups belong to the male sex, it is controlled automatically. The errors committed in matching the groups on pre-testing scores were controlled by the use of ANCOVA Statistical Technique. The obtained F ratio of 3.13 does not reach to the table value of F at .05 level of significance (table 6.52). Hence the difference between two adjusted means (table 6.50) is not significant. Consequently the null hypothesis of the study is accepted. Hence it is concluded that the male students do not indicate any difference in learning by two different programme learning techniques.
In this study sex (female) and pre-achievement were taken up as control variables. All the female subjects divided into two groups were matched on Pre-achievement in Commercial services such as Transport and Banking on scores of pre-testing and these groups were assigned two different treatments randomly. Sex variable was controlled by selecting only female students. The errors committed in matching the groups on pre-testing scores were controlled by the use of ANCOVA Statistical Technique. The obtained F ratio of 1.21 does not reach to the table value of F at .05 level of significance (table 6.55). Hence the difference between two adjusted means of two groups having two distinct treatments of programming is not significant (table 6.53). Consequently the null hypothesis was accepted. Hence it is concluded that there is no significant difference between adjusted means of two groups of girls matched on pre-achievement. Consequently the girls do not indicate any difference in their achievement on two different Techniques. So both the Techniques of programming are same for the girls groups.
In the present study types of programme and Sex are taken up as the independent variables. Four groups were formed on the basis of two levels of types of programme and two levels of Sex. These four groups were matched on the basis of Pre-testing of criterion test (tables 6.57 and 6.58). Equal number of observations were kept in each of the group through randomization. Then these groups were administered the types of programmes. At the end of programme the criterion test was administered to these groups. Observations on criterion scores of each groups were subject to the statistical treatment. The findings were as follows:

(i) Branching programme is significantly found more effective than its counterpart Linear programme on Transport and Banking commercial services. (table 6.60).

(ii) Girls are significantly found higher than the boys on criterion achievement through the programme learning (table 6.60). It appears that Programme learning material suits to the
girls temperament. It appears that they read more carefully of both types of programmes.

7.5 Suggestions for Further Studies:

The present study has widened the horizon for further studies. Findings of such studies advocate independent type of learning material which could be taken up by students themselves following the printed instructions. Such studies could be much helpful in spreading the idea of continuing education. Studies done by the learner at his will and time to satisfy his need would yield the maximum learning at the lowest spending time and energy. It is yet to be established that how far it becomes economical from the point view of time. Programme learning material seems to be more suited to the learners who have formed study habit, self-sufficiency reading habit and developed reading ability. It was originally thought out that programme learning technology of learning would be more useful in information catering subjects. However, gradually it has come to the light that subjects requiring development of skills also could be handled through
programme learning technology. It is only in the light of the above mentioned loud thinking the following topics have been suggested for further studies.

1. A study of Efficiency of types of programmes in the context of study habits and academic achievement of learners.

2. A study of Criterion Achievement through Programme Learning Technology in the context of academic aspirations and Reading achievement.

3. A Comparative study of Cost of academic Achievement in school subjects vis a vis Teacher and Programme Learning Technology.


5. A study of in-service programme to equip teacher with teaching models through P.L. technique in the context of study habits and aspirations of Teachers.

7.6 Conclusion:

The Programme Learning Technology is gradually gaining ground so far the mastering learning and continuing education. Concepts are being appreciated by the educationists and experimentalists in the field of education and technology. The Programme learning technology needs a greater mastery over the subject and its concepts on the part of programme writers. Of the two types of P.L.M., the Branching type needs a thorough understanding of the subject on the part of the programme writer. Programme learning is certainly not a substitution to the class room teacher but it can be certainly helpful to the learner as an instructional material to meet with the newer challenge of mastery learning of the subject. The students at present who fail to follow the teacher
in the class due to partly his fault or partly the teachers' inefficiency falls victim to the poor reading stuff like guides or teachers' notes or even sometimes they waste their time and money and energy in tuition classes. I am sure that the spread of programme learning technology on a wider scale would go a long way in helping the learners to match equally with the criterion reference testing independently.