CHAPTER IV
EXPERIMENTAL DESIGN AND PROCEDURE

4.1 Experimental Design

A 2x3x4 factorial design with repeated measures on the third factor is employed in the present study. The three variables chosen for the study are step size, reinforcement and response mode. The two levels chosen for step size are, small step size and large step size, the three levels of reinforcement are every response KCR, every fifth response KCR and no KCR, the four levels of response modes are 'written responses, responses to be undeclined, responses to be thought and provoked, and responses to be thought'. Step size is designated as 'factor A', reinforcement as 'factor B' and response mode as 'factor C'.

4.2 Sample

Two samples — one of boys and the other of girls — were taken up separately in this study.

Girls sample: The girls sample consisted of students studying in Xth standard from 'Convent High School', Hubli. The girls sample initially was comprised of 78 students drawn from two sections Xth A and Xth C distributed into six groups randomly. Thus each group consisted of 13 students i.e., 6 from Xth A and 7 from Xth C sections. Absenteeism in one group had to result in the deletion of subjects having rough correspondence in the other five groups also. As random distribution into groups was based on serial number assigned to Ss on the basis of an
aptitude test (See 4.3), it became possible to locate roughly corresponding ones. The girls sample finally retained for analysis consisted of 54 girls with each of the six groups getting 9 girls.

**Boys Sample**: The boys sample consisted of students studying in Xth standard from 'St. Marys' High School Hubli'. The boys sample initially was comprised of 90 students drawn from two sections Xth A and Xth B, distributed into six groups randomly. Thus each group consisted of 15 students i.e., 8 from Xth A and 7 from Xth B sections. Absenteeism in one group had to result in the deletion of subjects having rough correspondence in the other five groups also. The procedure followed in deletion was the same as in the case of girls sample. The boys sample finally retained for analysis consisted of 48 boys with each of the six groups getting 8 boys.

4.3 **Forming Treatment Groups**

The procedure followed for data collection in case of both the samples was the same.

**Science Aptitude Test**: The Science Aptitude Test (vide appendix-IX) was administered two days prior to starting the programme sessions proper to both girls and boys sample separately. Based on the scores obtained, the students were given serial numbers. Taking the random number table, the serially numbered students were randomly assigned to six groups. After assigning the students to the six groups, they were given special
roll numbers by the investigator for the convenience of administering the programme. The procedure described above was followed for both boys and girls sample separately to form the treatment groups.

4.4 Treatmentwise Distribution of Programmes

The distribution of treatment programmes constructed and described in the previous chapter into the 24 treatment cells is as shown in figure 3.601. As planned the six groups (=2x3) of each sample received successively on four days treatment programmes changing along the four levels of response mode. Thus the six groups were repeatedly administered programmes on four days respectively at four levels of factor C - Response Mode. This covered the 24 cells (2x3x4) contemplated in the design (refer figure 3.601).
4.5 The Experiment with the Girls Sample

4.51 The Seating Arrangement: The girls in the girls sample were seated based on the special roll numbers assigned to them as discussed in 4.3. For seating arrangement on the first day, refer figure 4.501. In the figure all students belonging to, for example, roll numbers 1, 12, 13, 24, 25, 36 and 37 belonged to cell 1, roll numbers 2, 11, 14, 23, 26, 35 and 36 belonged to cell 5, roll numbers 3, 10, 15, 22, 27, 34 and 39 belonged to cell 9, roll numbers 4, 9, 16, 21, 28, 33, and 40 belonged to cell 21, roll numbers 5, 8, 17, 20, 29, 32 and 41 belonged to cell 17 and roll numbers 6, 7, 18, 19, 30, 31, 42 belonged to cell 13. This arrangement was required to see that adjacently seated students did not get the programme of the same subject matter. This arrangement eliminated all possibility of copying responses from others. More over as each treatment (cell as referred to above in the figure) varied in at least one of the treatment dimensional levels, the matter for reading and the method of responding or receiving reinforcement differed. Thus it should be noted that copying altogether was not existent during the experiment. The seating arrangement shown permitted taking up X C standard in the forenoon and Xth A standard in the afternoon. This enabled the investigator herself to attend to both the classes and administer the pre-tests, programmes and post-tests as applicable to the respective treatment groups.

In the similar fashion, on the second day cells 2, 6, 10, 14, 18, 22 were taken up
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**FIG 4.501 Seating arrangement and programme distribution for girls' sample on the first day.**
The same six groups went through the treatments meant for the second day, i.e., (Cells 2, 6, 10, 14, 18 and 22). The seating arrangements is the same as discussed above for all four days, but the distribution of the cells differed, for details refer appendix XV, XVI, XVII, for the 2nd, 3rd and the 4th days. It is pertinent to mention here that on the third day the students went through treatment for cells 3, 7, 11, 15, 19, and 23 and on the fourth day treatments meant for cells 4, 8, 12, 16, 20 and 24 were administered. For details figure 4.401 and appendix may be consulted.

4.6 Programme Administration Procedure

Two days after administering the science aptitude test the 2x3x4 factorial experiment proper was conducted. The procedure followed for all four days was administering the relevant pre-test, programme and post-test in that order. Every day each subgroup received the pre-test, programme and post-test meant for the respective treatment combination only. For details figure 4.601 may be consulted. On all the four days three continuous periods were employed. The students were not allowed any recess till they completed one session of pre-test, programme, and post-test.

4.7 The Experiment with the Boys Sample

4.7.1 The Seating Arrangement: The boys in the boys sample were seated in the following manner (See figure 4.601) on the first day. In the above figure all students belonging to, for example, roll numbers 1, 12, 13, 24, 25, 36, 37 and 38 belonged to cell 1, roll numbers 2, 11, 14, 23, 26, 35, 38 and 47 to cell 5, roll numbers 3, 10, 15, 22, 27, 34, 39 and 46 belonged to cell...
Fig. 4.701: Seating arrangement and programme distribution for boys sample on the first day.
9, roll numbers 4, 9, 16, 21, 28, 33, 40 and 45 belonged to cell 21, roll numbers 5, 8, 17, 20, 29, 32, 41 and 44 belonged to cell 17 and roll numbers 6, 7, 18, 19, 30, 31, 42 and 43 belonged to cell 13. This arrangement as required to see that adjacently seated students did not get the programme of the same subject matter. This arrangement as in girls sample eliminated all possibility of copying responses from others. Moreover as each treatment varied in at least one of the treatment dimensional levels, the matter for reading and the method of responding or receiving reinforcement differed. Thus it should be noted that copying altogether was not existent during the experiment. The seating arrangement permitted taking Xth A standard in the forenoon session and Xth 6 standard in the afternoon. This enabled the investigator herself to once again as was done in the girls sample to attend to both the classes and administer the pre-test, programme and post-test.

In a similar fashion, on the second day cells 2, 6, 10, 14, 18, and 22 were taken up. The same six groups went through the treatments meant for the second day (i.e., cells. 2, 6, 10, 22, 18, and 14).
The seating arrangement is the same as discussed above for all four days, but the distribution of the cells differed. For details refer appendix XVIII, XIX, XX, for the 2nd, 3rd, and 4th day. On the third day the students went through treatments meant for cells 3, 7, 11, 15, 19 and 23. On the fourth day treatments meant for cells 4, 8, 12, 16, 20 and 24 were administered. For details figure 3 & 401 and appendix may be consulted.

The programme administration procedure for the boys sample was the same as the girls sample for details refer 4 6.

Thus, the data was collected on both girls and boys sample separately. The pre-test scores were deducted from post-test scores to obtain gain scores. The gain scores will be taken up for analysis in the next chapter. In the next chapter, a detailed presentation of two analysis of variance follows. The chapter also gives ensuing interpretation.