C H A P T E R VIII ·

E V A L U A T I O N

This chapter purports to evaluate three things, the results of the experiment, the programmed teaching strategy and the study as such.

1. Evaluating the Experiment Results

Two objectives were afixed at the design stage of the experiment.

  (1) To evaluate the performance of the experimental group on the post test and

  (2) To compare the performance of the experimental group with that of the control group.

(1) Performance of the Experimental group

Table 8.1 gives the total and the mean of scores gained by the experimental group on the pre and the post test.

Table 8.1

Total and Mean Scores of the Expt. group

Schools	Pre-test Scores		Post-test Scores	
	Total	Mean	Total	Mean
School 1	313	22.35	753	53.92
School 2	268	20.61	752	57.84
School 3	342	10.68	1,223	38.21
School 4	373	17.71	845	40.23
Average Mean	16.20		44.68	

Table 8.2 shows frequency-wise distribution of scores of the experimental group.

Table 8.2

Frequency-wise distribution of the Pre and Post-test Scores of the Experimental group

Test	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80
Pre-test	27	26	17	5	3	2	0	0	0
Post test	2	7	13	8	16	16	11	6	1

The mean score and the frequency wise distribution show that the performance of the experimental group on the post test was better than that on the pretest. This improvement in performance can be attributed to the independent variable, programmed teaching, introduced in the experiment.

(2) Comparing performance of Both the Groups

The second objective of the experiment was to compare the performance of the experimental group with that of the control group. The Null hypothesis was that there is no difference between the performance of both the groups; whatever differences appear are due to chance variations.

To avoid chance variations the intervening variables were controlled as far as possible and the groups were matched statistically by following analysis of co-variance.

Lindquist's procedure (Lindquist, 1940, P.196) was followed while computing the analysis of co-variance. Analysis of data was done with the help of a simple calculating machine.

(a) Computing analysis of co-variance

The following steps were taken to compute the analysis of co-variance.

- Total and mean for each class, each school(s) and each method (M) for both final and initial scores were computed.

- The sum of squares for MXS for initial and final scores were computed.

— The sum of products for M.S and class was computed.

— The sum of products for MXS was secured for by substracting the sum of product of M and S from that of classes.

— The sum of squares and products for M + MXS was computed.

— The adjusted sum of squares for M + M x S was computed.

— The reduced sum of squares for M was computed by substracting the adjusted sum of squares for M x S from that of M + M x S.

— Reduced method variance was secured by dividing reduced sum of squares for M by d f for M.

— Adjusted M x S error variance was secured by dividing adjusted sum of squares for M x S by its d.f.

— F was secured by dividing reduced variance for methods by adjusted M x S error variance.

(b) Notations used

X represents raw scores on the pretest.

Y represents raw scores on the post test.

T_x and T_y repfesent sum total of all pre and post test scores respeéively.

M_x and M_y represent corresponding mean.

G T represents grand total.

T_m represents methods total.

T_s represents school total.

T_c represents class total.

$\sum T_m^2$, $\sum T_s^2$ and $\sum T_c^2$ represent sum of squares of methods, schools and classes total.

(c) Analysis of data

Table 8.3 gives total and mean of pre (initial) and post (final) test scores of the experimental and the control group.

Table 8.3

Total and mean of the Pre and Post test scores

School	PRE-TEST SCORES						POST-TEST SCORES					
	Expt.Group		Control Gr.		School		Expt.Gr.		Control Gr.		School	
	Total	Mean	Total	Mean	Total	Mean	Total	Mean	Total	Mean	Total	Mean
1 N=(14+14)	313	22.35	356	25.42	669	23.89	755	53.92	574	41.00	1329	47.46
2 N=(13+13)	268	20.61	112	8.61	380	14.61	752	57.84	297	22.84	1049	40.34
3 (N=32+32)	342	10.68	347	10.84	689	10.76	1223	38.21	550	17.18	1773	27.70
4 (N=21+21)	373	17.76	356	16.95	729	17.35	845	40.23	467	22.23	1312	31.23
TOTAL= N = 160	1296	16.20	1171	14.51	2467	15.41	3575	44.68	1188	23.60	5463	34.14

Step 1

Computing sum of squares of Methods (Pre test scores).

$$= \frac{E\ T^2m}{N_m} - \frac{GT^2}{N}$$

$$= \frac{1296^2 + 1171^2}{80} - \frac{2465 \times 2467}{160} = 96.91$$

Step 2   Sum of squares for schools

$$\Sigma\left(\frac{T^2 s}{n_s}\right) - \frac{GT^2}{N}$$

$$= \left(\frac{669^2}{28} + \frac{380^2}{26} + \frac{689^2}{64} + \frac{729^2}{42}\right) - 38038.05$$

$$= 3570.97$$

Step 3   Sum of squares for classes

$$\Sigma\left(\frac{\Sigma T^2 c}{n_c}\right) - \frac{GT^2}{N}$$

$$= \left(\frac{313^2 + 356^2}{14} + \frac{268^2 + 112^2}{13} + \frac{342^2 + 347^2}{32} + \frac{373^2 + 356^2}{21}\right)$$

$$- 38038.05$$

$$= 4580.27$$

Step 4   Sum of squares for M x S

= Sum of squares for classes — sum of squares for methods — sum of squares for schools

$$= 4580.27 - 96.91 - 3570.97$$

$$= 912.39$$

Step 5   Sum of squares for Methods (Post test scores)

$$\frac{\Sigma T_m^2}{n_m} - \frac{GT_y^2}{N}$$

$$= \frac{3575^2 + 1888^2}{80} - \frac{5463 \times 5463}{160}$$

$$= 17787.57$$

Step 6 **Sum of squares for schools**

$$\frac{\Sigma(T_s^2)}{n_s} - \frac{GT^2}{N}$$

$$(\frac{1329^2}{28} + \frac{1049^2}{26} + \frac{1778^2}{64} + \frac{1312^2}{42}) - 186527.03$$

$$= 8978.13$$

Step 7 **Sum of squares for classes**

$$\frac{\Sigma(ET_c^2)}{n_c} - \frac{GT^2}{N}$$

$$= (\frac{755^2 + 574^2}{14} + \frac{752^2 + 297^2}{13} + \frac{1223^2 + 550^2}{32} + \frac{845^2 + 467^2}{21}) -$$

$$186527.03$$

$$= 28589.68$$

Step 8 **S um of squares for M x S**

$$= 28599.68 - 17787.57 - 8978.13$$

$$= 1823.98$$

	ΣX^2	ΣY^2
M =	96.91	17787.57
M x S =	912.39	1823.98

Step 9 **Sum of prodcts for METHODS**

$$n\Sigma_{\overline{xy}} = (Tx_1 My_1 + Tx_2 My_2) - \frac{Tx\ Ty}{N}$$

$$= 1296x44.68) + (1171x23.6) - \frac{2467 \times 5463}{160}$$

$$= 1308.25.$$

Step 10 <u>Sum of Products for SCHOOLS</u>

$= (669x47.46) + (380x40.34) + (689x27.70) + (729x31.23)$

$- \dfrac{2467x5463}{160}$

$= 4699.28$

Step 11 <u>Sun of Products for CLASSES</u>

$= (313x53.92) + (268x57.84) + (342x38.21) + (373x40.23)$

$+ (356x41.00) + (112x22.84) + (347x17.19) + (356x22.24)$

$- \dfrac{2467 \times 5463}{160}$

$= 7255.51$

Step 12 <u>Sum of Products for M x S</u>

= Sum of Products for CLASSES — Sum of Products for
METHODS — Sum of Products for SCHOOL

$= 7255.51 - 1308.25 - 4699.28$

$= 1247.98$

Step 13 <u>Sums of scores $(\Sigma x^2, \Sigma y^2)$ andProducts for M and M x S</u>

	Σx^2	Σxy	Σy^2
M	= 96.91	1308.25	17787.57
M x S	=912.39	1247.98	1823.98
M+MxS	=1009.30	2556.23	19611.55

Step 14　Computing the adjusted sum of Squares for M x S

$$= \Sigma y^2 - \left[\frac{(\Sigma xy)^2}{\Sigma y^2}\right] \quad \text{(For M x S)}$$

$$= 1823.98 - \frac{(1247.98)^2}{912.39}$$

$$= 116.98$$

Step 15　Computing the adjusted sum of Squares for M+MxS

$$= \Sigma y^2 \frac{(\Sigma xy)^2}{\Sigma x^2} \quad \text{(For M+MxS)}$$

$$= 19611.55 - \frac{(2556.23)^2}{1009.30}$$

$$= 13137.45$$

Step 16　Reduced sum of squares for M

= Sum of squares for M+MxS — Sum of S quares for MxS

= 13137.45 — 116.98

= 13020.47

Step 17　Reduced METHOD variance

= Reduced sum of Squares for M $\div$ d.f. for M

= 13020.47 $\div$ 1

= 13020.47

Step 18　Adjusted M x S (error) variance

= Adjusted squares for M x S $\div$ its d.f.

= 116.98 $\div$ 2

= 58.49

Step 19   <u>Computing F</u>

= Reduced variance for METHODS ÷ adjusted M x S variance

= 13020.47 ÷ 58.49

= 222.6

For 1 and 2 d.f. an F of 98.49 is required for significance at the 1% level. F is significant.

Hence the Null hypothesis is rejected.

(d) <u>Experimental findings</u>

1. The experimental group has improved its pre-test mean score of 16.20 to 44.68 the post test *mean* score.

2. There is a significant difference ~~between the~~ ʻ*favouring* in performance ~~of~~ the experimental group ~~and~~ *over* the control group on the post test.

Both the findings ~~prove~~ *support the hypothesis* that students learn better when taught through programmed teaching.

2. Evaluating Programmed Teaching

Programmed teaching being a systems approach needed to be evaluated on systems criteria. The first criterion of a system ~~ha~~ is to see whether the system has achieved its pre-stated goal. In the study the systems goal or objective was that students should secure more than 40% marks on the post test . The post test data show that the group has achieved its objective. The mean score is 44.68 which is more than 50 per cent achievement.

Besides evaluating a system on performance, it should also be evaluated on three other criteria, viz., utility, cost and time. It was decided upon in the beginning that programmed teaching strategy would be evaluated on two criteria only, viz., performance and utility. The strategy, therefore, was not evaluated in terms of cost and time.

Utility assessment

(a) Programmed teaching worked well with teachers who were untrained in teaching English. This point is of potent importance. There are many teachers in secondary and higher primary schools who are not trained. This method would prove very useful in schools who are running short of trained teachers.

(b) In the beginning of the study six major factors were found out which seemed to hinder students' performance in English. The programmed teaching strategy overcame four of the six felt difficulties.

- It oriented teachers in managing classroom instruction. To that extent it overcame shortage of trained teachers.

- It provided knowledge of content to teachers. To that extent it helped in developing subject competence.

- It provided auto-instructional material to students. Thus the teaching strategy provided free time to teachers, and helped in lightening the teaching load.

- It provided remedial exercises to slow learners.

3. <u>Evaluating the Study</u>

At the beginning of the study five major objectives were specified.

(1) To find out difficulties (as perceived by teachers) which hamper effective teaching and learning of English.

(2) To develop the concept of programmed teaching.

(3) To develop a package for programmed teaching comprising of programmed material, remedial exercises, content notes and teacher's guide.

(4) To appraise the effectiveness of programmed teaching in terms of performance and utility.

(5) To incorporate systems approach in the analysis of problem and the design of the strategy.

All the above objectives have been realised.

(1) The investigator found that there are 13 significant difficulties (chapter IV) which according to teachers are real learning and teaching blocks. The thirteen difficulties were classified into six major difficulties. Briefly stated they are: shortage of trained teachers, lack of subject competence of teachers, dearth of good teaching, learning material, poor socio economical background of students and uncongenial school climate.

(2) The concept of programmed teaching was developed as reported in chapter three and four. Programmed teaching was viewed as a strategy rather than as a method. Flow chart 9 shows elements and functions of programmed teaching and flow chart 10 shows the pattern of interaction between men (teachers and students) and materials (programmed teaching material).

(3) The programmed teaching packages were developed. Chapter six outlines the development procedure. The materials form appendix 2.

(4) The effectiveness of programmed teaching was
empirically assessed. Evaluation of the experimental
data has already been reported in the earlier
sections of this chapter.

(5) The systems approach has been incorporated both
in the analysis of the problem and in designing the
strategy. The investigation of the problem followed
the Kaufman's systems model of education. The
teaching strategy followed Basu's (1970   ) model.