CHAPTER VI

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With a view to visualise an analytical picture of process and structure variables of educational environment in Government inservice training centres, both at Patiala and Jalandhar, which are related to the professional competency of social studies and mathematics teachers, the statistical techniques of t-ratios, one way analysis of variance and multiple regression analysis were used. In the present study, the effects of institutional variables, sex, and training on teaching effectiveness, teaching attitude, rigidity-flexibility, educational awareness, achievement of teachers in social studies/mathematics and school results of teachers were studied. However, the gain scores of the teachers on these variables were taken as data for analysis of variance and multiple regression analysis. Besides studying the training influence on different criterion measures through analysis of variance, the 't' test was used to study the direction of difference. The t-ratios were used to study the significance of difference between means of the initial and terminal behaviours of the teachers on all these
variables and also to study the significance of difference between the means of teaching effectiveness, achievement of teachers and school results with respect to the measure of physical resources of inservice training institutions. Besides, multiple regression analysis was applied to seek the best linear relationship of process variables and structure variables respectively with each of the product variables.

The investigator took a sample which consisted of 480 teachers in all, which was further divided into eight groups of sixty teachers each. Out of these eight groups, four groups were considered as exposed groups and four as unexposed groups. Two exposed groups - one of social studies and the other of mathematics teachers - and likewise two unexposed groups were taken from Patiala division and verisimilarly two exposed groups and two unexposed groups from Jalandhar division. Each exposed group in social studies or mathematics comprised of sixty teachers who taught the eighth class students, selected out of the groups of the working teachers who had been sent by the education department for the academic session 1984-85 from Patiala or Jalandhar division concerned to undergo the inservice education programme. Each unexposed group in social studies or mathematics comprised of sixty
teachers randomly selected out of the teachers who had been teaching eighth class students in Government Secondary Schools of the Patiala or Jalandhar division concerned and who had never been exposed to inservice training in the said academic session, and the proceeding one also. Unexposed groups in each subject and at each divisional level were taken with a view to ascertain comparatively whether the measured increase in professional competency of the exposed groups is because of the impact of inservice education programme on the teacher trainees or it was just due to the natural tendencies of on-the-job experiences, unrelated to any type of particularly organised inservice education programme. The primary purpose was to secure representative population to be able to utilize inferential statistics in data analysis. For this purpose the selection of sample was based on random method of sampling.

For the purpose of assessing the initial and terminal behaviour of the teachers of exposed groups, they were administered with the following scales and tests:

1. Teacher effectiveness scale (TES)
2. Teacher attitude scale (TAS)
3. Rigidity flexibility scale (RIS)
4. Educational awareness test (EAT)
5. Achievement test in social studies/mathematics for teachers (ATT)

Besides, the school results of the teachers for the sessions before and after they were exposed to the inservice education programmes were obtained. An opinionnaire to study the reactions of the trainees about the physical resources of Government Inservice Training Institutions at Patiala and Jalandhar and a questionnaire to study the impact of inservice training upon the teacher trainees were also administered at the end of the training.

Likewise the unexposed groups were also administered with the same scales and tests, namely, TES, TAs, RIs, EAT and ATT twice at the parallel times. The school results of these teachers were also taken for two academic sessions, viz. the current session when they were pre-tested and post-tested and the preceding one. However, unlike the teachers of exposed groups, the question of administering an opinionnaire regarding the physical resources of inservice training institutions and a questionnaire regarding the impact of inservice training did not arise in case of teachers of unexposed groups. The details of these tools have already been given in chapter IV.
It is clear from the table of analysis of variance (chapter V, Table No. 5.17) that F-ratio for the measure of the efficacy of inservice training organised for social studies and mathematics teachers separately at Patiala and Jalandhar was found to be 2.05, which is non-significant. Thus, it is evident that there is no significant difference between any two of the four exposed groups in respect of the efficacy of inservice education programmes. Hence, the hypothesis that 'there is significant difference between any two of the four exposed groups in respect of the efficacy of inservice training programme organised for social studies and mathematics teachers separately at Patiala and Jalandhar' is rejected.

The results of analysis of variance regarding TES as depicted in Table No. 5.24 show that the variance in respect of the impact of educational environment between the teaching effectiveness of teachers of any of the exposed groups and the teaching effectiveness of the teachers of any of the unexposed groups is significant in all cases. Hence, the hypothesis that 'there is significant difference in respect of the impact of educational environment between the teaching effectiveness of social studies and mathematics teachers of the exposed groups and that of the unexposed groups' is accepted.
The significant difference between the means of pre-test and post-test scores of exposed groups in respect of teacher effectiveness and the same difference being non-significant in case of unexposed groups (see Table No. 5.16a) further support the view that there exists significant difference in respect of the impact of educational environment between the teaching effectiveness of social studies and mathematics teachers of the exposed groups and that of unexposed groups.

Stent (1965) found that teachers who participated in inservice education programmes improved their skills and were able to solve immediate problems more realistically. The present study also highlights the fact that teachers become more effective in teaching after participating in the inservice education programmes.

The results of analysis of variance regarding TAS as depicted in Table No. 5.25 show that the variances of exposed groups except exposed Patiala mathematics group with any of the four unexposed groups are significant in all the cases. Hence, the hypothesis that there is significant difference in respect of the impact of educational environment between the teacher attitude of social studies and mathematics teachers of the exposed
groups and that of the unexposed groups is partially accepted.

It is worth noticing that the variance of exposed Patiala mathematics teachers in respect of Teacher attitude with any of the four unexposed groups is non-significant probably because the inservice education programme designed for exposed Patiala mathematics group was more content-oriented which had to be so because of the introduction of new courses in mathematics.

The significant difference between the means of pre-test and post-test scores of exposed groups in respect of teacher attitude and the same difference being non-significant in case of unexposed groups (see Table No.5.16) further highlight the view that there exists significant difference in respect of the impact of educational environment between teacher attitude of social studies and mathematics teachers of the exposed groups and that of the unexposed groups.

Lazarus (1972) found that inservice programme of study in mathematics education has positive effect on teachers' attitudes towards teaching mathematics. In the present study the results of significance of difference between means of pre-test and post-test scores on teacher
attitude scale show that inservice education programme helps the teachers to change their attitude positively toward teaching.

The results of analysis of variance regarding rigidity and flexibility as depicted in Table No. 5.26 shows that the variances of exposed groups with unexposed groups taken one by one are significant in every case except the variance of exposed Patiala mathematics group with unexposed Patiala mathematics group, where it is non-significant probably because the teachers of unexposed Patiala mathematics group might have tended to be flexible due to the effects of environment prevailing at their respective institutions, of course, as per chance. Hence the hypothesis that 'there is no significant difference in respect of the impact of educational environment between the rigidity and flexibility of social studies and mathematics teachers of the exposed groups and that of the unexposed groups is partially accepted.

The significant difference between the means of pre-test and post-test scores of exposed groups in respect of rigidity and flexibility and the same difference being non-significant in case of unexposed groups (see Table No. 5.16A) further support the view that there exists
significant difference in respect of the impact of educational environment between the rigidity flexibility of social studies and mathematics teachers of the exposed groups and that of the unexposed groups.

Bush (1971) observed that teachers in general are not flexible enough to make adjustments to practice according to the different situations confronted. But the present study shows that the teachers of the exposed groups have become more flexible as depicted by the results of the significance of difference between the means of pre-test and post-test scores on rigidity and flexibility scale.

The results of analysis of variance regarding educational awareness as depicted in Table No. 5,27 show that the variances of exposed groups with unexposed groups taken one by one are significant in every case. Hence, the hypothesis that 'there is significant difference in respect of the impact of educational environment between the educational awareness of social studies and mathematics teachers of the exposed groups and that of the unexposed groups is accepted.

The significant difference between the means of pre-test and post-test scores of exposed groups in respect of educational awareness and the same difference being
non-significant in case of unexposed groups (see Table No. 5.16A) further support the view that there exists significant difference in respect of the impact of educational environment between the educational awareness of social studies and mathematics teachers of the exposed groups and that of the unexposed groups.

Richey (1957) referred to the tremendous need of inservice education for even modestly educated and professionally trained teachers. The present study also highlights the fact that inservice education programme helps the teachers to become educationally more aware than they were before.

The results of the analysis of variance regarding achievements of teachers as depicted in Table No. 5.28 show that the variances of the exposed groups with unexposed groups taken one by one are significant in every case. Thus the hypothesis that 'there is significant difference in respect of the impact of educational environment between the achievement of social studies and mathematics teachers of the exposed groups and that of the unexposed groups' is accepted.

The significant difference between the means of pre-test and post-test scores of exposed groups in
respect of the achievement of teachers and the same difference being non-significant in case of unexposed groups (see Table No. 5.16A) further support the view that there exists significant difference in respect of the impact of educational environment between the achievement of social studies and mathematics teachers of the exposed groups and that of the unexposed groups.

Black (1961) found out that inservice education influences the knowledge and skill of the teachers. The present study also supports his thesis that the inservice education programme helps the teachers to increase their achievement on achievement test in social studies/mathematics for teachers.

The results of analysis of variance regarding the school results of teachers as depicted in Table No. 5.29 show that the variances of exposed groups with unexposed groups taken one by one are significant in every case, hence, the hypothesis that 'there is significant difference in respect of the impact of educational environment between the school results of social studies and mathematics teachers of exposed groups and that of the unexposed groups' is accepted.
It is worth mentioning here that the difference between the pre-test and post-test scores in respect of school results of teachers is significant in cases of both exposed groups and unexposed groups except in case of unexposed Jalandhar mathematics group. But the results of analysis of variance as mentioned above clearly show that the improvement of school results of teachers of exposed groups is significantly better than the improvement of school results of teachers of unexposed groups. Thus it is conspicuous to understand that the analysis of variance gives a better picture to make a comparison between the betterment of results of teachers of exposed groups and school results of teachers of unexposed groups. And thus the hypothesis in the present context as mentioned above stands accepted as such.

Selser (1962) found that the students of experimental mathematics teachers made statistically higher scores on post-test than did students of the control group teachers. Bass (1980) concluded that techniques learned by the Teachers in inservice training contributed to change in pupil achievement. The present study also brings to light that inservice educational programme helps the teachers to increase their school results significantly more than the results of teachers without having undergone any such training.
The results of analysis of variance regarding teaching effectiveness as depicted in Table No. 3.36 show that the variance between the male teachers of any of the four unexposed groups with female teachers of any of the four unexposed groups is non-significant. But in case of exposed groups the variances between male teachers and female teachers in eight cases are non-significant and significant in rest of the eight cases. Hence the hypothesis that 'there is no significant difference between the social studies and mathematics male and female teachers of exposed groups and those of unexposed groups with respect to the measure of teaching effectiveness' is partially accepted.

Bina Roy (1970) found that the sex of the teachers in general is unrelated to the ratings received. However, the difference, if any, between the women and men trainees faded away in service as regards their effectiveness as teachers. The present study finds that the sex of the teachers is related to their teaching effectiveness in eight out of the sixteen cases.

The results of analysis of variance regarding teacher attitude as depicted in Table No. 5.37 show that the variances between male teachers and female teachers of unexposed groups are non-significant except between male teachers of unexposed
Jalandhar mathematics group and female teachers of unexposed Patiala mathematics group being significant. But in case of exposed groups the variances between male teachers and female teachers are significant in eleven cases and non-significant in rest of the five cases. Hence the hypothesis that 'there is no significant difference between the social studies and mathematics male and female teachers of exposed groups and those of unexposed groups with respect to the measure of teacher attitude' is partially accepted.

The results of analysis of variance regarding rigidity-flexibility as depicted in Table No. 3.38 show that the variance between the male teachers of any of the four unexposed groups with female teachers of any of the four unexposed groups is non-significant. But in case of exposed groups the variances between male teachers and female teachers are significant in ten cases and non-significant in rest of the six cases. Hence the hypothesis that 'there is no significant difference between the social studies and mathematics male and female teachers of exposed groups and those of unexposed groups with respect to the measure of rigidity-flexibility' is partially accepted.

The results of analysis of variance regarding educational awareness as depicted in Table No. 5.39 show that the variance between the male teachers and female
teachers of unexposed groups are non-significant in every case. But in case of exposed groups the variances between male teachers and female teachers are significant in eleven cases and non-significant in rest of the five cases. Hence the hypothesis that 'there is no significant difference between the social studies and mathematics male and female teachers of exposed groups and those of unexposed groups with respect to the measure of educational awareness' is partially accepted.

The results of analysis of variance regarding achievement of teachers as depicted in Table No. 5.40 show that the variances between the male and female teachers of four unexposed groups are non-significant in all, except one, cases. But in case of exposed groups the variances between male teachers and female teachers are significant in ten cases and non-significant in rest of the six cases. Hence the hypothesis that 'there is no significant difference between the social studies and mathematics male and female teachers of exposed groups and those of unexposed groups with respect to the measure of achievement of teachers' is partially accepted.

The results of analysis of variance regarding school results of teachers as depicted in Table No. 5.41 show that the variances between male and female teachers of unexposed groups are non-significant. But in case of exposed groups
the variances between male teachers and female teachers are significant in seven cases and non-significant in rest of the nine cases. Hence the hypothesis that 'there is no significant difference between the social studies and mathematics male and female teachers of exposed groups and those of unexposed groups with respect to the measure of school results of teachers' is partially accepted.

The results of multiple regression analysis (vide Table No. 5.42) show that the conjoint effect of process variables on achievement of teachers is equal to the individual correlation between achievement of teachers and teaching effectiveness and it is less than the individual correlation between teaching effectiveness and educational awareness of teachers. The variable educational awareness of teachers does not significantly contribute to the value of achievement of teachers. The only significant contribution to achievement of teachers is made by teaching effectiveness. Hence the hypothesis that 'the conjoint effect of process variables on achievement of teachers is higher than any of the individual correlations in a bivariate analysis and the process variables contribute differently to the criterion measure of professional competency' is partially accepted.

The results of multiple regression analysis (vide Table No. 5.43) show that the conjoint effect of process
variables on school results of teachers is higher than any of the individual correlations in a bivariate analysis. The process variables, i.e. teaching effectiveness and educational awareness of teachers make significant contributions differently to the school results of teachers. Hence, the hypothesis that 'the conjoint effect of process variables on school results of teachers is higher than any of the individual correlations in a bivariate analysis and the process variables contribute differently to the criterion measure of professional competency' is accepted.

The results of multiple regression analysis (vide Table No. 5.44) show that the conjoint effect of structure variables on achievement of teachers is equal to individual correlation between achievement of teachers and rigidity-flexibility and less individual correlation between teacher attitude and rigidity-flexibility. The variables teacher attitude and rigidity-flexibility make only non-significant contribution each to the value of achievement of teachers. Hence the hypothesis that 'the conjoint effect of structure variables on achievement of teachers is higher than any of the individual correlations in a bivariate analysis and the structure variables contribute differently to the criterion measure of professional competency' is rejected.
The results of multiple regression analysis (vide Table No. 5.45) show that the conjoint effect of structure variables on school results of teachers is higher than any of the individual correlation in a bivariate analysis. The structure variables, i.e. teacher attitude and rigidity-flexibility make significant contributions differently to the school results of teachers. Hence, the hypothesis that, 'the conjoint effect of structure variables on school results of teachers is higher than any of the individual correlations in a bivariate analysis and the structure variables contribute differently to the criterion measure of professional competency' is accepted.

Presently professional competency includes three parameters, viz., teacher effectiveness, achievement of teachers and school results of the teachers. So the hypothesis relating to the impact of physical structure of Government Inservice Training Institutions upon the teachers in respect of the measure of professional competency is tested in three directions as follows:

1. The results of significance of difference between means of gain scores of teachers of exposed groups in respect of teaching effectiveness show that t-ratios between the 'yes' and 'no' response categories of teachers are
significant in case of only two items out of twenty five items in all. Hence, the hypothesis that 'there is no significant difference between the negative and positive response-categories of the teachers with respect to the impact of physical structure of Government Inservice Training Institutions upon professional competency of the teachers' is partially accepted in case of teacher effectiveness as a measure of professional competency.

However, it may be worth mentioning here that in case of item No. 4, the teachers with 'yes' responses, i.e. those who affirmed that the lecture theatres are free from extraneous disturbances have gained significantly more than the teachers of the 'No' response category. Thus it may be conjectured that if the extraneous disturbances to the lecture theatres are minimised, the teachers with 'No' responses will also gain more.

Besides in case of item No. 24 the teachers with 'Yes' responses, i.e. those who affirmed that the staff of the institution concerned works in a team spirit have significantly gained more than the teachers of the other category. Thus it may be contemplated that if the team spirit among the members of the staff of the institution be displayed better to the teacher trainees with 'No' responses, they can also gain more.
II. The results of the significance of difference between means of gain scores of teachers of exposed groups in respect of achievement of teachers show that the t-ratios between the 'Yes' and 'No' response-categories are not significant in any case. Hence the hypothesis that 'there is no significant difference between the positive and negative response-categories of the teachers with respect to the impact of physical structure of Government Inservice Training Institutions upon professional competency of the teachers' is accepted in respect of achievement of teachers as a measure of professional competency.

III. The results of the significance of difference between means of gain scores of teachers of exposed groups in respect of school results of teachers show that t-ratios between 'Yes' and 'No' response-categories of teachers are significant in case of only two items out of twenty five items in all. Hence the hypothesis that 'there is no significant difference between the positive and negative response categories of the teachers with respect to the impact of physical structure of Government Inservice Training Institutions upon professional competency' is partially accepted in respect of school results as a measure of professional competency.
However, it is worth mentioning that in case of item No. 9, the teachers with 'Yes' responses i.e. those who affirmed the sufficiency of hostel accommodation for the teacher trainees have gained significantly more than the teachers of 'No' response category. Thus it appears that the teachers who felt at ease in the hostel have significantly gained more than those who felt uneasy regarding their residential conditions during the inservice education period. Hence, it may be contemplated that if the hostel facilities are improved it will positively affect the teachers for bettering their school results.

Besides in case of item No. 12, the teachers with 'Yes' responses i.e., those who affirmed that the library of the institution is spacious enough to accommodate all the teacher trainees have significantly gained more than the teachers of the other category. Thus it may be conjectured that making library more spacious can affect the teachers positively for bettering their school results.

A view of the above mentioned results of t-ratios for the significance of difference between means of the pre-test and post-test scores shows that the teachers of exposed groups have significantly gained in professional competency as a result of their exposure to inservice
education programmes organised for their respective subjects at both the Government Inservice Training Institutions as compared to the stagnation in professional competency of the teachers of the unexposed groups, who had not undergone any such training during the parallel periods. Although teachers of the unexposed groups, barring teachers of unexposed Jalandhar mathematics group, have bettered their school results during the current academic session as compared to their previous school results, yet the teachers of exposed groups have improved their school results significantly better than the teachers of unexposed groups have done as stated above. Hence, it is revealed that the inservice education programmes have positive bearing on the development of professional competency of teachers.

The results of Anova show, as F-ratio is non-significant, that there is no significant difference between any two of the four exposed groups in respect of the efficacy of inservice training programmes organised for social studies and mathematics teachers separately at Patiala and Jalandhar. It is, therefore, revealed that the teachers were influenced alike by the inservice education programmes held at both the centres separately.
It is also clear from the results of analysis of variance that the variances in respect of teaching effectiveness, educational awareness, achievement of teachers and school results of teachers as criterion measure of professional competency, are more marked between the exposed groups and the unexposed groups. This obviously shows that the measures of teaching effectiveness, educational awareness, achievement of teachers and school results of teachers of the exposed groups have been significantly better than those of the teachers of unexposed groups. Likewise the variances between the exposed groups and unexposed groups are more marked in twelve cases out of sixteen, and fifteen cases out of sixteen regarding the measures of teacher attitude and rigidity-flexibility respectively. Hence it is revealed that process and structure variables of educational environment of inservice institutions are positively related with the development of professional competency of teachers.

The results of analysis of variance in respect of teaching effectiveness, teacher attitude, rigidity-flexibility, educational awareness, achievement of teachers and school results of teachers show that the male teachers of the unexposed groups have been found identical with the
female teachers of unexposed groups, except male teachers of Jalandhar mathematics group with female teachers of Patiala mathematics group in respect of TAS and male teachers of Jalandhar mathematics group with female teachers of Jalandhar social studies group in respect of achievement of teachers. On the other hand the male teachers of exposed groups vary from female teachers of exposed groups significantly as for teaching effectiveness in eight cases, for teacher attitude in eleven cases, for rigidity-flexibility in ten cases, for educational awareness in eleven cases, for achievement of teachers in ten cases and for school results of teachers in seven cases out of sixteen cases each. This obviously shows that male teachers of exposed groups vary significantly from the female teachers of the exposed groups in almost 60 per cent of the cases with regard to the criterion measures of professional competency.

The results of multiple regression analysis show that the conjoint effect of process variables, i.e., TES and EAT on ATT could be explained in terms of multiple correlation $R$ and that teaching effectiveness had accounted for the higher contribution to the maximum variance of $R^2$ than the non-significant, though positive, contribution of educational awareness to the same. Similarly the process
variables had the conjoint effect on school results of teachers as explainable in terms of multiple correlation R and both the criterion measures teacher effectiveness and educational awareness had differently accounted significantly for the maximum variance of $R^2$.

The conjoint effect of structure variable i.e. TAS and HIS an ATT could not be explained in terms of multiple correlation R which, though positive, came out to be of the order of zero. Thus each of the structure variables did not significantly account for its contribution to the maximum variance of $R^2$. However, the conjoint effect of structure variables on school results of teachers could be explained in terms of multiple correlation R and each of the structure variables had accounted for significant contribution to the maximum variance of $R^2$.

In a nut shell, it is revealed that SFT as a criterion measure of professional competency is positively correlated with both process and structure variables, whereas achievement of teachers as a measure of professional competency is positively correlated with only one of the process variables, i.e. teaching effectiveness.
The results of t-ratios regarding the impact of institutional variables upon the professional competence of teachers show in particular that if the extraneous disturbances to the lecture theatres are minimised and if the team spirit among the members of the staff of the institution concerned be displayed better to the trainees, they can gain significantly more than otherwise. Similarly, if the hostel accommodation is provided sufficiently for the convenient stay of trainees and if the library of the institution is set spacious enough to accommodate the trainees, they can gain significantly better than otherwise.


Though the aforesaid studies were conducted on different samples and in different conditions by using different tests, yet their relevance in the present context cannot be underrated. However, some pertinent studies which attract attention in a bit more detail, are given as below:

Stent (1965) found that teachers who participated in inservice education programme, improved their skills and were able to solve immediate problems more realistically.

Black (1961) found out that inservice education influences the knowledge and skills of the teachers. Openshaw (1962) also concluded that the greater the participation by the teacher in inservice education programmes the better the learning which is likely to result.

Weaver (1962) analyzed the effect of inservice education programme on pupils and found that the students who were in the class under the experimental teachers
made significantly greater gains in adjustment than students of teachers in the control groups did. Selsor (1962) also found out that the students of experimental mathematics teachers made statistically higher scores on post-test. Flanders (1962) investigated the use of interaction analysis of inservice training of teachers who did show significant changes in their classroom behaviour which were consistent with the intent of the training.

Lucas (1963) and Schwalenberg (1965) concluded that the most successful orientation programmes were those which derived their bases and objectives from teachers' needs and which were based on the knowledge of the background of teachers.

Lazarus (1972) found that inservice programme of study in mathematics education has positive effect on teachers' attitudes towards teaching mathematics. Manning (1972) also concluded that utilizing a mathematics laboratory approach with the mathematics inservice education of teachers is an effective way to bring about positive change in the mathematics attitude and achievements of their students. Hargrove (1973) concluded that courses and inservice training appeared to be positive factors in influencing favourable attitudes
towards teaching readings in the content areas. Grant (1973) applied analysis of variance and showed that attendance in the inservice classroom improved teacher achievement over no attendance at .01 level of significance.

Bass (1980) concluded that techniques learned by the teachers in inservice training contributed to change in pupil achievement. Garroutte (1980) also concluded that inservice training produced a positive change in teacher's pedagogical knowledge in the experimental group of teachers. Whereas Raina (1983) revealed that student teachers have more favourable attitudes than the inservice teachers.