CHAPTER VI

SUMMARY CONCLUSIONS AND EDUCATIONAL IMPLICATIONS

INTRODUCTION

The present study entitled "The Effectiveness of Microteaching for the Development of Skills Specific to the teaching of Modern Mathematics" pertains to the area of preservice teachers' training for classroom instruction. It relates to identifying the teaching skills required of a teacher of modern mathematics for effective classroom instruction and the ways of planning a strategy for developing such skills as also selecting a rational model of preparing relevant instructional materials for such skills.

Considerable research efforts have been directed to identifying the general teaching skills by various workers in this field. But it is likely that the general skills may not have applicability for the teaching of different school subjects equally alike and that only some of the selected skills may be sampled for the teaching of a specific subject whereas the sampled skills may vary from one subject to another for reasons of differences in the nature of the content and the teaching methods employed to teach the subject. Thus, it is presumed that there will be skills specific to the teaching of modern mathematics because of the typical nature of the subject. This forms the basis for raising the first
issue: Whether there are teaching skills specific to the teaching of modern mathematics at secondary school stage.

The review of trends of researches led to the inference that efforts should be made to identify subject specific skills. Though a few attempts have been made and some are in progress in the direction of identifying subject specific skills but none in the field of modern mathematics. The present study, therefore, attempted to fill the gap by identifying skills specific to the teaching of modern mathematics at the secondary stage.

Studies have been undertaken to see the feasibility of development of general teaching skills among the teachers or the student teachers and it has been found that there is a possibility to develop such skills. In these studies, microteaching has been used as a medium for developing the skills. Moreover, the superiority of this technique over the conventional practice teaching to bring a change in attitude towards teaching has also been reported, though scantily.

Accepting that microteaching has superiority over conventional practice teaching in developing general teaching skills and changing the attitude towards teaching the question arises: Does it hold true in case of modern mathematics? The second issue examined in the present study, therefore, is: Whether microteaching has an advantage over the conventional
practice teaching in developing skills specific to the teaching of modern mathematics and changing their attitude towards teaching.

The comparison between the relative effectiveness of microteaching and conventional practice teaching can be looked into from yet another point of view as to:

Whether the microteaching group has superiority over the conventional practice teaching group in using the learnt teaching skills in an integrated form in a normal classroom setting. This is the third issue examined in this study.

But before making an attempt to develop the teaching skills, a student teacher will require instructional materials to have a clear understanding of the skills to be acquired. There can be various models of developing such materials so a rational analysis of the different models of instructional materials in the light of the present day schools is needed. Thus the fourth issue examined in the present study is:

Whether in conditions of the present day schools will it not be worthwhile to analyse the models of developing instructional materials and make a rational choice for developing such materials for skills specific to the teaching of modern mathematics.

The testing of worth of microteaching in the subject of modern mathematics seems to be an unexplored area, therefore,
to examine the issues raised in the present study twelve hypotheses have been framed and stated in null form as under:

$H_1$: The experimental group and the control group do not differ significantly on the skill of developing problem solving ability in the posttest.

$H_2$: The experimental group and the control group do not differ significantly on the skill of formulating mathematical models in the posttest.

$H_3$: The experimental group and the control group do not differ significantly on the skill of using blackboard in the posttest.

$H_4$: The experimental group and the control group do not differ significantly on the skill of developing problem solving ability in the retention test.

$H_5$: The experimental group and the control group do not differ significantly on the skill of formulating mathematical models in the retention test.

$H_6$: The experimental group and the control group do not differ significantly on the skill of using blackboard in the retention test.

$H_7$: There is no significant change in attitude of the student teachers of the experimental group towards teaching form pretest to posttest, and from pretest to retention test.
There is no significant change in attitude of the student teachers of the control group towards teaching from pretest to posttest, and from pretest to retention test.

The experimental group and the control group do not differ significantly on the posttest in respect of the competence to teach modern mathematics.

The experimental group and the control group do not differ significantly on the retention test in respect of the competence to teach modern mathematics.

The experimental group and the control group do not differ significantly on the posttest in the ability to use the learnt skills in an integrated form.

The experimental group and the control group do not differ significantly on the retention test in the ability to use the learnt skills in an integrated form.

METHOD AND PROCEDURE

The study was completed in three phases, namely, (I) identification of teaching skills, (II) development of instructional material, and (III) study of the relative effectiveness of microteaching and conventional practice teaching for developing skills specific to teaching of
modern mathematics at the secondary school stage. The
description of the methodologies adopted at the three phases
of study is given below:

PHASE I: IDENTIFICATION OF TEACHING SKILLS

To identify the skills specific to the teaching of
modern mathematics the approach of 'analysing the teaching
tasks into various subtasks and inferring about the various
teaching behaviours required to perform the tasks' was
adhered to in the present study. The process was completed
in five steps:

- enlisting of skills
- preparation of an opinionnaire
- first try out and modifications
- second try out
- finalisation of list of skills

The details of these steps have been given in
Chapter three. As an outcome of the above process eight
skills were identified the hierarchy of which is:

(i) skill of developing problem solving ability
(ii) skill of formulating mathematical models
(iii) skill of using blackboard
(iv) skill of handling mathematical instruments
(v) skill of appreciation
(vi) skill of analysis
(vii) skill of application
(viii) skill of performing mathematical operations
The three skills with the top rating that is at serial no. (i), (ii) and (iii) in the above hierarchy were selected for developing the instructional materials.

Sample

For phase (I) of the study population consisted of the teacher educators, research fellows, inservice teachers, and student teachers having background of mathematics and skill based approach to teaching. The sample was raised from the population by drawing individuals randomly for each stratum. Thus the sample was a 'stratified sample'. The size of the sample for first try out and second try out was forty seven and forty eight, respectively (vide Tables 2.1 and 2.2, respectively, Ch.II).

PHASE II: DEVELOPMENT OF INSTRUCTIONAL MATERIALS

In the second phase of the study the instructional materials for the three skills selected for the purpose in phase (I) were developed in the form of handbooks by following the 'research and development approach'. The main steps of the process were:

- preparation of the outlines
- preparation of drafts of handbooks
- first field testing and modifications
- second field testing
- handbooks
The details of these steps have been given in Chapter three.

Sample

In the second phase, too, stratified sample was raised from the population consisting of teacher educators, research fellows, inservice teachers and student teachers having background of mathematics as well as skill based approach to teaching. For first field testing and second field testing the sample consisted of twenty seven and twenty eight persons, respectively (vide Table 2.3 and 2.4, respectively, Ch.II).

PHASE III: STUDY OF THE RELATIVE EFFECTIVENESS

To study the relative effectiveness of microteaching and conventional practice for developing skills specific to the teaching of modern mathematics an experiment partly with 'pretest posttest control group design' and partly with 'posttest only design' was conducted.

Sample

For conducting the experiment two equal sized (n=11) samples were randomly selected from the population of student teachers of Saraswati College of Education, Charkhi Dadri session 1980-81 who opted mathematics as one of their method subjects.

Tools

For conducting the experiment four tools namely,
(i) The Observation Proforma for the Skill of Developing Problem Solving Ability, (ii) The Observation Proforma for the Skill of Formulating Mathematical Models, (iii) The Observation Proforma for the Skill of Using Blackboard, and (iv) The Modern Mathematics Teaching Competence Scale (The MMTCS) were constructed by the investigator and two standardized tools, (i) The Ahluwalia Teacher Attitude Inventory (The ATAI) and (ii) The Indore Teaching Assessment Scale (The ITAS) were selected for use in the present study.

Treatment

Prior to the treatment the attitudes of student teachers of both the groups towards teaching were measured through the ATAI. Then they were oriented to herbartian steps of teaching, format of lesson planning followed by a demonstration lesson by the investigator in the normal classroom. The experimental group, in addition to general orientation, was oriented to various elements of microteaching and skills of teaching modern mathematics. Then the student teachers of both the groups prepared and delivered three lessons turn by turn in the normal classroom which were observed and evaluated on proformas for the three skills after which the former and the latter group were exposed to the treatments of microteaching and conventional practice teaching, respectively as per details given in chapter two. After the practice phase the student teachers of the experimental group delivered three lessons on
each skill in the microteaching setting. The control group, too was observed in the three lessons for each of the three skills. The average scores were taken as posttest scores for the respective skills for both the groups. The practice phase was followed by delivery of three lessons by each student teacher of both the groups in the normal classroom setting which were evaluated on the MMTCS and the ITAS. Once again the attitude of both the group towards teaching were measured. All the measurements taken in the posttest were repeated after a gap of one month and the average scores so obtained were taken as retention test scores.

Statistical Techniques

In the first phase of the study Chi-square test was employed and in the third phase Wilcoxon Rank Sum Test, Analysis of Covariance, 't' test, and decile points were used to examine the different hypotheses (For details refer chapter II).

CONCLUSIONS

The completion of the study led to the following conclusions:

1. Eight skills specific to the teaching of modern mathematics were identified by 'analysing the teaching tasks into various subtasks and inferring the various teaching behaviours required to perform the tasks'. These skills in the hierarchical order are:
(i) skills of developing problem solving ability
(ii) skill of formulating mathematical models
(iii) skill of using blackboard
(iv) skill of handling mathematical instruments
(v) skill of appreciation
(vi) skill of analysis
(vii) skill of application
(viii) skill of performing mathematical operations.

2. Three skills, namely, skill of developing problem solving ability, skill of formulating mathematical models, and skill of using blackboard were selected for developing the instructional materials in the form of handbooks on the basis of top ratings. However, logical basis for selecting these skills were:

(a) Skill of Developing Problem Solving Ability

Learning to solve problems is the most significant learning at every moment in a class of modern mathematics for several reasons:

- problem solving is an excellent way of promoting the learning of new concepts
- the learning of skills through purely manipulative exercises has been found inadequate
- the skill of problem solving is more permanent than the knowledge of specific facts or conclusions
- the researches of the modern mathematics are largely the outcomes of problem solving

(b) Skill of Formulating Mathematical Models

Modern mathematics is a subject solely concerned with the construction of mathematical models. Thus, it is the need of the subject, that pupils who are learning it should be in a position to formulate mathematical models. For effective classroom instructions a teacher of modern mathematics should, therefore, be skilful enough to develop the skill of formulating models among his pupils.

(c) Skill of Using Blackboard

Both from psychological view and pedagogical viewpoint the blackboard is one of the most powerful teaching aids. It draws and sustains the attention of the pupils towards the subject and provides an added stimulus for learning. It helps in presenting the subject matter clearly and logically.

3. Symbolic instructional materials in the form of three handbooks containing: the description of the skill, its components and subcomponents; exercises; observation proformas; and model lessons were developed. The handbooks were named as (a) A Handbook on Developing Problem Solving Ability (b) A Handbook on Formulating Mathematical Models; and (c) A Handbook on Using Blackboard. Research and Development approach was adhered to for developing these handbooks.
4. To study the impact of acquiring the skills specific to teaching of modern mathematics on development of competence to teach modern mathematics a five point rating scale was constructed and named as 'The Modern Mathematics Teaching Competence Scale (The MMTCS)'. The most important characteristic of the scale is that a glossary has been developed as to facilitate observers for better rating and to have high inter-observer reliability.

5. The microteaching has an advantage over the conventional practice teaching for development of skills specific to teaching of modern mathematics.

6. Neither microteaching nor the conventional practice teaching has any impact on the attitude of student teachers towards teaching.

7. The student teachers trained through microteaching attain higher level of competence to teach modern mathematics at secondary stage than those trained through conventional practice teaching as measured by the Modern Mathematics Teaching Competence Scale (The MMTCS).

8. The student teachers of microteaching group have higher level of ability to use the learnt skills in integrated form in normal classroom setting than that of control group as measured by the Indore Teaching Assessment Scale (The ITAS).
EDUCATIONAL IMPLICATIONS

Microteaching is a recent innovative technique of training teachers and student teachers, particularly in India, and more so for the development of subject specific skills. Thus, it is felt that the findings of this study may have direct relevance to working out an appropriate strategy for the training of student teachers for imparting classroom instruction of modern mathematics. Some of the implications based upon the findings of this study may be stated as under:

- Emphasis on microteaching for the training of prospective mathematics teachers would yield better results in as much as classroom instruction in modern mathematics is concerned. Special attention is required to be paid to the development of eight skills which were identified in this study as basic to teaching of modern mathematics at secondary stage.

- The handbooks development in this study can have a great utility in the training of student teachers of modern mathematics. The handbook on a specific skill becomes handy and serves as a text for the student teachers disregarding the approach of training whether through conventional or through microteaching.
The observation proformas developed in this study may be used for improving the classroom instruction of a student teacher of modern mathematics by constantly letting him know the results of his performance thereby getting feedback in behavioural terms.

Guidance and selection of teachers for teaching modern mathematics can be based upon the assessment of competence of student teachers by using the Modern Mathematics Teaching Competence Scale developed for this study.