SUMMARY AND CONCLUSIONS

Introduction

Teaching competence can be developed through development of teaching skills which are different for different subjects because of their differential nature. Research efforts have been made to identify general teaching skills as well as subject specific skills but none in the field of teaching of biology. In this study, it has been attempted to identify skills specific to the teaching of biology.

It has been established that microteaching develops general skills and general teaching competence but relative development of skills specific to teaching of biology and biology teaching competence through the microteaching versus the conventional teaching needs exploration. The relative development of the ability to use the learnt skills in an integrated form and of the attitude towards teaching are the other related problems examined in this study.

Statement of the Problem

In the light of the rationale presented above, the present study entitled 'Teacher Competence As Related to Development of Skills Specific to Teaching of Biology Through Microteaching Among Prospective Secondary School Teachers' was undertaken.

Hypotheses:

The following twenty two null hypotheses formed the basis of the study. Alternate research hypotheses were also formulated, as given in chapter one, in case the null hypotheses got refuted.
These were formulated in favour of the microteaching as compared to the conventional teaching.

Null Hypothesis $H_1$  
The experimental group and the control group do not differ significantly on the skill of demonstrating on the post test.

Null Hypothesis $H_2$  
The experimental group and the control group do not differ significantly on the skill of drawing diagrams on the post test.

Null Hypothesis $H_3$  
The experimental group and the control group do not differ significantly on the skill of blackboard writing on the post test.

Null Hypothesis $H_4$  
The experimental group and the control group do not differ significantly on the skill of probing questioning on the post test.

Null Hypothesis $H_5$  
The experimental group and the control group do not differ significantly on the skill of using basic skills of biology practicals on the post test.
Null Hypothesis $H_{6e}$

The experimental group and the control group do not differ significantly on the heuristic skill on the post test.

Null Hypothesis $H_{7e}$

The experimental group and the control group do not differ significantly on the skill of demonstrating on the retention test.

Null Hypothesis $H_{8e}$

The experimental group and the control group do not differ significantly on the skill of drawing diagrams on the retention test.

Null Hypothesis $H_{9e}$

The experimental group and the control group do not differ significantly on the skill of black board writing on the retention test.

Null Hypothesis $H_{10e}$

The experimental group and the control group do not differ significantly on the skill of probing questioning on the retention test.

Null Hypothesis $H_{11e}$

The experimental group and the control group do not differ significantly on the skill of using basic skills of biology practicals on the retention test.
Null Hypothesis $H_{12a}$

The experimental group and the control group do not differ significantly on the heuristic skill on the retention test.

Null Hypothesis $H_{13a}$

The experimental group and the control group do not differ significantly on the post test in respect of biology teaching competence.

Null Hypothesis $H_{14a}$

The experimental group and the control group do not differ significantly in respect of biology teaching competence on the retention test.

Null Hypothesis $H_{15a}$

The experimental group and the control group do not differ significantly on the post test in respect of general teaching competence.

Null Hypothesis $H_{16a}$

The experimental group and the control group do not differ significantly on the retention test in respect of general teaching competence.

Null Hypothesis $H_{17a}$

The experimental group and the control group do not differ significantly on the post test in the ability to use the learnt skills in an integrated form.
Null Hypothesis H18a

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.

Null Hypothesis H19a

There is no significant change in the attitude of the prospective secondary school teachers of the experimental group towards teaching from pretest to post test.

Null Hypothesis H20a

There is no significant change in the attitude of the prospective secondary school teachers of the control group towards teaching from pretest to retention test.

Null Hypothesis H21a

There is no significant change in the attitude of the prospective secondary school teachers of the control group towards teaching from pretest to post test.

Null Hypothesis H22a

There is no significant change in the attitude of the prospective secondary school teachers of the control group towards teaching from pretest to retention test.
The study was conducted in the following four phases:

- Identification of skills specific to teaching of biology
- Development of self instructional material
- Development of tools for data collection
- Experimental study of the relative development of the teaching competence as related to the development of skills specific to teaching of biology through microteaching versus the conventional training among prospective secondary school teachers.

Phase I:

Identification of skills specific to teaching of biology.

The following six skills specific to teaching of biology were identified:

i) Skill of demonstrating
ii) Skill of drawing diagrams
iii) Skill of blackboard writing
iv) Skill of probing questioning
v) Skill of using basic skills of biology practicals
vi) Heuristic skill

Sample

Stratified random samples of 180 and 158 for the first and second field testing respectively were drawn out of the population of teacher educators, research fellows, inservice teachers, other M.Sc./B.Sc., B.Eds. and prospective teachers.
Phase Two

Development of Self-instructional Material.

Self instructional material containing the meaning, concept, episodes, components, subcomponents, examples and model lessons for these six skills specific to teaching of biology was prepared in the form of handbooks. Though it was a continuous process of research and development, yet the main steps may be stated as the research based development of the outlines, gathering suggestions and comments, preparing the initial draft of the self instructional material, first field testing, rewriting, second field testing and rewriting.

Sample

Stratified samples of 40 each for the first field testing and second field testing were drawn randomly out of the two populations of teacher educators, research fellows, inservice teachers, other M.Sc./B.Sc., B.Ed.s and prospective teachers.

Phase Three: Tools for Data Collection

In order to collect various types of data for different variables, three types of tools were used, that is,

(A) Tools developed by the investigator (author of the thesis)
(B) Standardized tools adopted with slight modifications.
(C) Standardized tools adopted as they are.
The following eight tools were developed and standardized by the investigator for the present study:

i) Personal Information Proforma

ii) Opinionnaire No.1

iii) Opinionnaire No.2

iv) Observation Schedule for the Skill of Demonstrating

v) Observation Schedule for the Skill of Drawing Diagrams

vi) Observation Schedule for the Skill of Using Basic Skills of Biology Practicals.

vii) Observation Schedule for the Heuristic Skill

viii) Biology Teaching Competence Scale (BTC Scale).

The following two standardized tools were adopted after modifications:

i) Observation Schedule for the Skill of Using Blackboard

ii) Observation Schedule for the Skill of Probing Questioning.

The following three tools were selected for use out of the available standardized tools:

i) Baroda General Teaching Competence Scale (BGTC Scale)

ii) The Indore Teaching Assessment Scale (ITAS)

iii) The Ahluwalia Teacher Attitude Inventory (ATAI)

Phase four

Experimental study of the relative development of the teacher competence as related to the development of skills
specific to teaching of biology through the microteaching versus the conventional training among prospective secondary school teachers.

Design

To test the hypotheses related to the relative developments of the six skills specific to the teaching of biology, biology teaching competence, general teaching competence, ability to use the learnt skills in an integrated form and attitude towards teaching, the experiment was conducted partly, with 'pretest post test control group design' and partly with 'post test only design'.

Treatments

Attitudes of the prospective teachers of both the groups towards teaching was measured through Ahluwalia Teacher Attitude Inventory before the treatments. Experimental as well the control group were given orientation of Herbartian steps of teaching, format of lesson planning followed by a demonstration lesson by the investigator in the normal classroom. A common experimental procedure was followed for all the six skills. Experimental group was given orientation in microteaching, the six skills specific to the teaching of biology at secondary school level, of how to use the observation schedules of the six skills and the process of giving feedback. The control group did not receive such type of microteaching training.
Microteaching treatments to the experimental group consisted of giving instructional handbooks for self study, model lesson by the investigator, teach session, feedback by peers and the investigator, reteach and refeed back.

After the treatment, prospective teachers of the experimental group delivered two lessons each on the six skills in microteaching setting. These lessons were evaluated by the investigator and the peers on the observation schedules specifically developed for this purpose. At the end, the prospective secondary school teachers of the experimental group delivered two lessons of thirty five minutes in the normal setting in the practising school.

These lessons were evaluated on:

(i) Biology Teaching Competence Scale (BTC Scale)
(ii) Baroda General Teaching Competence Scale (BGTC Scale)
(iii) Indore Teaching Assessment Scale (ITAS)

The prospective secondary school teachers of the control group were asked to deliver twelve more lessons so that their performance was evaluated on the six observation schedules of the six skills. Then they were asked to deliver two more lessons in which their biology teaching competence was measured with the help of BTC scale and general teaching competence was measured with the help of BGTC Scale.

Both the groups were then administered Ahluwalia Teacher Attitude Inventory (ATAI).
Retention Test

After a gap of 40 days, experimental as well as control group was evaluated on the following:

(i) Six observation schedules for the six skills.
(ii) BTC Scale
(iii) BGTC Scale
(iv) ITAS

Variables

During experimentation, the experimental variables related to the development of the skills specific to teaching of biology through microteaching. The following were the dependent variables:

- development of six skills specific to teaching of biology as measured through corresponding observation schedules.

- development of biology teaching competence as measured by BTC Scale.

- development of skill based general teaching competence as measured by BGTC Scale.

- the ability to use the learnt skills in an integrated manner in macrolessons measured through ITAS.

- the effect of development of teaching skills on the change in attitude towards teaching of prospective teachers as measured by Ahluwalia Teacher Attitude Inventory.
Statistical Techniques

In all cases, average of two lessons was taken as scores. Scores on Observation Schedules, Biology Teaching Competence Scale and Baroda General Teaching Competence Scale (in case of evaluation by the investigator as well as by peers) were analysed by ANCOVA. The 't' value and deciles of the scores on Indore Teaching Assessment Scale were calculated. The development of attitude as measured by Ahluwalia Teacher Attitude Inventory was analysed by employing 't' test.

CONCLUSIONS

The completion of the present study led to the following conclusions:

- The following six skills specific to the teaching of biology were identified.
  - Skill of demonstrating
  - Skill of drawing diagrams
  - Skill of blackboard writing
  - Skill of probing questioning
  - Skill of using basic skills of biology practicals
  - Heuristic skill.

- Superiority of the microteaching versus the conventional training in developing the skills specific to the teaching of biology, namely, the skill of demonstrating, skill of drawing diagrams, skill of blackboard writing, skill of probing questioning, skill of using basic skills of biology practicals.
practicals and heuristic skill was established at .01 level of significance on the post test as well as retention test.

- Prospective secondary school teachers trained through the microteaching develop biology teaching competence significantly more (at .01 level of significance) than those having the conventional training.

- Transfer of training is there and prospective secondary school teachers trained through microteaching develop general teaching competence significantly more (at .01 level) than those having conventional training.

- The performance of the microteaching technique in developing the ability to use the learnt skills in an integrated form is better than that of the conventional training at .01 level of significance. This integration took place vicariously and did not need deliberate planning.

- Neither microteaching nor the conventional training has any effect on the attitude of prospective secondary school teachers towards teaching.

EDUCATIONAL IMPLICATIONS

Of all the factors influencing the quality of education and its contribution to national development, the competence of teachers is most significant. The findings of the present study have established the importance and utility of the microteaching
in developing the skills specific to the teaching of biology, biology teaching competence, general teaching competence and ability to use the learnt skills in an integrated form. Thus adopting microteaching as an essential programme of teacher training would yield more competent biology teachers than they are being produced by the conventional training.

Six handbooks developed in the present study for the six skills specific to teaching of biology can be used for developing biology teaching competence as well as general teaching competence. The use of these needs to be popularised.

Biology teaching competence scale can be used for future research, and for assessing the biology teaching competence of the prospective teachers for guiding and counselling them.

SUGGESTIONS FOR FURTHER RESEARCH

1. 'Relative effectiveness of different techniques of feedback for developing the skills specific to teaching of biology' may be studied.

2. A study of relative effectiveness of different strategies of integration of skills in relation to development of biology teaching competence may be undertaken.