

236

FACTORS INFLUENCING THE EFFECTIVENESS
OF MICROTEACHING IN A
TEACHER EDUCATION PROGRAMME

VOLUME 1

Hugh Desmond Batten, B.Sc., B.Ed.

Submitted in fulfilment of the requirements for the
degree of Doctor of Philosophy in the Department of
Education, University of Stirling, 1978.

BEST COPY

AVAILABLE

Variable print quality

TABLE OF CONTENTS

VOLUME 1

	Page
Declaration	(vii)
Acknowledgments	(viii)
List of Tables	(ix)
List of Figures	(xv)
Chapter	
INTRODUCTION	1
I. MICROTEACHING, MICROTEACHING PROGRAMMES, AND THE PRESENT STUDY	4
The Introduction of Microteaching	4
Research Evidence Prior to the Present Study	10
Studies relating to the general effectiveness of microteaching	10
Studies relating to variables within the microteaching format	18
Studies relating to teacher questioning behaviours	30
The Present Study	32
Summary statement of the purposes of the present study	38
Statement of hypotheses tested	39
II. DEVELOPMENT AND ASSESSMENT OF THE INSTRUMENTS	46
The Lesson Analysis Instrument	47
Classification of student teacher questioning behaviours	47

	Page
Classification of pupil response behaviours	52
Classification of follow-up behaviours subsequent to the asking of an initial question or a response to such a question	54
Criterion measures	55
Development of the Instrument	61
Procedures	61
Issues	63
Assessment of the Lesson Analysis Instrument	70
Inter-judge agreement	70
Details of organization - phase one	77
Results - phase one	78
Details of organization - phase two	86
Results - phase two	88
Development of Instruments to Measure Attitudes and Reactions to Practice Teaching in the Microteaching Context and in the Primary School Classroom	99
The microteaching context	99
The primary school classroom context	101
Summary	102
III. EXPERIMENTAL DESIGN AND ORGANIZATION	103
Design Outline	106
Stage 1, Spring Semester 1972	107
Experimental sample	107
Factorial design including pre-treatment and post-treatment lessons	109
Teaching programmes	114
Semester organization	124
Experimental treatments	126

	Page
Stage 2, Autumn Semester 1972	128
Experimental sample	128
Factorial design including pre-treatment and post-treatment lessons	129
Teaching programmes	131
Semester organization	134
Experimental treatments	139
Participants attitudes to the programme	140
Stage 3, Spring Semester 1973	141
Experimental sample	141
Factorial design	142
Experimental treatment and organizational details	144
Participants attitudes to practice teaching experiences	146
Summary	146
IV. ANALYSIS OF RESULTS RELATING TO TEACHER AND PUPIL BEHAVIOURS	147
Value of Analysis of Covariance	148
Spring Semester 1972	156
Results	158
Testing of Hypotheses	195
Autumn Semester 1972	197
Results	198
Performance by the Sample Taking the Stirling Programme in the Spring Semester 1972 and the Different Sample Taking a Similar Stirling Programme in the Autumn Semester 1972	237
Testing of Hypotheses	239

	Page
Spring Semester 1973	242
School classroom performance by student teachers originally part of the Spring semester 1972 sample	242
Results	244
School classroom performance by student teachers originally part of the Autumn semester 1972 sample	279
Results	281
Testing of Hypotheses	317
Summary	320
V. ANALYSIS OF RESULTS RELATING TO STUDENT TEACHER AND STAFF TUTOR ATTITUDINAL MEASURES	322
Autumn Semester 1972	322
Questionnaire to student teachers	322
Questionnaire to staff tutors	368
Spring Semester 1973	384
Questionnaire to student teachers - Primary school classroom experience	384
Testing of Hypotheses	388
VI. CONCLUSIONS OF THE STUDY IN RELATION TO RECENT RESEARCH	391
General Effectiveness of Microteaching and the Presentation Phase	393
The Feedback Phase	401
Inter-personal feedback	401
Technical feedback	403
Transfer	405
Students' Reactions to Microteaching	412

	Page
Concluding Summary	415
REFERENCES	419

This thesis contains no material which has been accepted for the award of any other degree or diploma in any University, and to the best of my knowledge and belief contains no material previously published or written by another person, except where due reference has been made in the text of the thesis.

Hugh O'Brien.

ACKNOWLEDGMENTS

The completion of this research programme required the understanding and co-operation of a large number of persons, and I wish to record my appreciation to this group for their contribution to my work.

The basic data for the study was provided by a student population which was always helpful. The teaching staff of the Department of Education displayed tolerance in having their courses held steady over the duration of the study. Professor Baillie Ruthven and subsequently Professor Arnold Morrison, as Chairmen of the Department, willingly provided support and facilities as they were requested.

Significant contributions were made by several people at particular stages of the research.

Margaret Batten, Sally Brown, and Phyllis McAdam spent many precious hours assisting with the development of the lesson analysis instrument and the assessment of its reliability.

Ken Hore displayed initiative and persistence in maintaining technical support to the research through a difficult period.

Dr Richard White, Monash University, was always ready to discuss methods and problems associated with the analysis of the gathered data.

When the thesis reached draft form Ian Fraser and Graeme Withers generously offered their time and energies to read, edit, and to clarify the general presentation. For the final thesis presentation tribute must be paid to Cate Domini for her unflagging and willing effort in typing this substantial piece of work. The final product reflects the excellence of her work. Beverley Smith's contribution was appreciated in the hectic final stages of presentation. Throughout, the staff of the Department of Educational Resources, Lincoln Institute, maintained interest in, and support for, my thesis efforts.

Finally, two people deserve especial acknowledgment.

Margaret Batten has not deviated from a position of total encouragement, tolerance, and understanding throughout the various stages of this project. Quite apart from the countless hours of assistance given with the mechanical tasks of coding, proofreading, and collation, Margaret's sensitivity to my morale and endeavour cannot be overstated.

At best, the final form of this thesis is but a poor reflection of the quality of experience gathered by me over the total project at the hands of Donald McIntyre. As my supervisor, and as a colleague and friend, I wish to record my high regard for Donald McIntyre as a person and as a professional educator. Consistent with the man, the supervision has been thorough and yet gentle. Donald McIntyre has a splended ability to illuminate difficulties and to inspire enthusiasm for the pursuit of fundamental issues.

LIST OF TABLES

Table		Page
1.	Student Teacher Questioning Behaviours Inter-judge Agreement	81
2.	Pupil Response Behaviours Inter-judge Agreement	82
3.	Inter-judge Agreement on Individual Events	85
4.	Student Teacher Questioning Behaviours Inter-judge Agreement - Phase Two	89
5.	Pupil Response Behaviours Inter-judge Agreement - Phase Two	90
6.	Inter-judge Agreement on Individual Events - Phase Two	91
7.	Time Taken to Code Lessons - Phase Two	92
8.	Stability of Coding Behaviour	94
9.	Stability of Coding Behaviour by Individual Events	95
10.	Design for Comparison (a)	110
11.	Design for Comparison (b)	110
12.	Design for Comparison (a) (i)	129
13.	Design for Comparison (a) (ii)	129
14.	Design for Comparison (a) (iii)	129
15.	Design for Comparison (b) (i)	130
16.	Design for Comparison (b) (ii)	130
17.	Design for Comparison (b) (iii)	131
18.	Stage 3 Factorial Design	142
19.	Product-moment correlations between Pre-treatment and Post-treatment Behaviours. Spring Semester 1972	149
20.	Product-moment correlations between Pre-treatment and Post-treatment Behaviours Autumn Semester 1972	152

Table	Page
21. Criterion Behaviour: Total knowledge and lower order synthesis teacher questions	159
22. Criterion Behaviour: Total comprehension, application, analysis and synthesis teacher questions	161
23. Criterion Behaviour: Total analysis and synthesis teacher questions	163
24. Criterion Behaviour: Total analysis teacher questions	165
25. Criterion Behaviour: Total synthesis teacher questions	167
26. Criterion Behaviour: Total "original" pupil responses	171
27. Criterion Behaviour: Total pupil responses "supported"	173
28. Criterion Behaviour: Total pupil responses "original" and "supported"	175
29. Criterion Behaviour: Total analysis and synthesis questions followed by "original" pupil response	177
30. Criterion Behaviour: Total analysis and synthesis questions followed by a pupil response "supported"	179
31. Criterion Behaviour: Total analysis and synthesis questions followed by "original" and "supported" pupil responses	181
32. Criterion Behaviour: Total occasions "no opportunity given to pupils to respond" to a teacher question	184
33. Criterion Behaviour: Total occasions "no response offered" to a teacher question	186
34. Criterion Behaviour: Total teacher prompts	188
35. Criterion Behaviour: Total teacher probes	190
36. Criterion Behaviour: Analysis plus synthesis category teacher probes	192
37. Criterion Behaviour: Total knowledge and lower order synthesis teacher questions	199

Table	Page
38. Criterion Behaviour: Total comprehension, application, analysis and synthesis teacher questions	201
39. Criterion Behaviour: Total analysis and synthesis teacher questions	203
40. Criterion Behaviour: Total analysis teacher questions	205
41. Criterion Behaviour: Total synthesis teacher questions	207
42. Criterion Behaviour: Total "original" pupil responses	212
43. Criterion Behaviour: Total pupil responses "supported"	214
44. Criterion Behaviour: Total pupil responses "original" and "supported"	216
45. Criterion Behaviour: Total analysis and synthesis questions followed by "original" pupil response	218
46. Criterion Behaviour: Total analysis and synthesis questions followed by a pupil response "supported"	220
47. Criterion Behaviour: Total analysis and synthesis questions followed by "original" and "supported" pupil responses	222
48. Criterion Behaviour: Total occasions "no opportunity given to pupils to respond" to a teacher question	226
49. Criterion Behaviour: Total occasions "no response offered" to a teacher question	228
50. Criterion Behaviour: Total teacher prompts	230
51. Criterion Behaviour: Total teacher probes	232
52. Criterion Behaviour: Analysis plus synthesis category teacher probes	234
53. Performance of Two Student Teacher Samples on Criterion Behaviours Relevant to the Stirling programme taught in the Spring and Autumn Semesters, 1972	238

Table	Page
54. Sample Population Spring Semester 1972 and in Spring Semester 1973	243
55. Criterion Behaviour: Total knowledge and lower order synthesis teacher questions	245
56. Criterion Behaviour: Total comprehension, application, analysis and synthesis teacher questions	247
57. Criterion Behaviour: Total analysis and synthesis teacher questions	249
58. Criterion Behaviour: Total analysis teacher questions	251
59. Criterion Behaviour: Total synthesis teacher questions	253
60. Criterion Behaviour: Total "original" pupil responses	256
61. Criterion Behaviour: Total pupil responses "supported"	258
62. Criterion Behaviour: Total pupil responses "original" and "supported"	260
63. Criterion Behaviour: Total analysis and synthesis questions followed by "original" pupil response	262
64. Criterion Behaviour: Total analysis and synthesis questions followed by a pupil response "supported"	264
65. Criterion Behaviour: Total analysis and synthesis questions followed by "original" and "supported" pupil responses	266
66. Criterion Behaviour: Total occasions "no opportunity given to pupils to respond" to a teacher question	269
67. Criterion Behaviour: Total occasions "no response offered" to a teacher question	271
68. Criterion Behaviour: Total teacher prompts	273
69. Criterion Behaviour: Total teacher probes	275

Table		Page
70.	Criterion Behaviour: Analysis plus synthesis category teacher probes	277
71.	Treatment Group Samples in Spring Semester 1973	281
72.	Criterion Behaviour: Total knowledge and lower order synthesis teacher questions	282
73.	Criterion Behaviour: Total comprehension, application, analysis and synthesis teacher questions	284
74.	Criterion Behaviour: Total analysis and synthesis teacher questions	286
75.	Criterion Behaviour: Total analysis teacher questions	288
76.	Criterion Behaviour: Total synthesis teacher questions	290
77.	Criterion Behaviour: Total "original" pupil responses	293
78.	Criterion Behaviour: Total pupil responses "supported"	295
79.	Criterion Behaviour: Total pupil responses "original" and "supported"	297
80.	Criterion Behaviour: Total analysis and synthesis questions followed by "original" pupil response	299
81.	Criterion Behaviour: Total analysis and synthesis questions followed by a pupil response "supported"	301
82.	Criterion Behaviour: Total analysis and synthesis questions followed by "original" and "supported" pupil responses	303
83.	Criterion Behaviour: Total occasions "no opportunity given to pupils to respond" to a teacher question	306
84.	Criterion Behaviour: Total occasions "no response offered" to a teacher question	308
85.	Criterion Behaviour: Total teacher prompts	310
86.	Criterion Behaviour: Total teacher probes	312

Table		Page
87.	Criterion Behaviour: Analysis plus synthesis category teacher probes	314
88.	Summary of Responses to Questionnaire for Student Teachers, Section One	325
89.	Data for Questions Concerned with the Characteristics of the Teaching Programme	341
90.	Data for Questions Concerned with the Planning for the "Teach" Session	348
91.	Data for Questions Concerned with Attention to Behaviours in Microteaching Lessons	350
92.	Data for Questions Concerned with the Replay Session	353
93.	Data for Questions Concerned with the Function of the Staff Tutor in the Replay Session	359
94.	Data for Questions Concerned with the "Reteach" Session	362
95.	Data for Questions Concerned with the Value of the Microteaching Experience	366
96.	Primary School Experience Student Questionnaire Response Level by Treatment Groups	384

LIST OF FIGURES

Figure		Page
1.	The Taxonomy of Educational Objectives in the Cognitive Domain	49
2.	Microteaching Classroom	122
3.	Recorded Picture of Practice Teaching Lessons	123
4.	Stage 2, Autumn Semester 1972 Schedules	135

INTRODUCTION

Education courses leading to the award of degrees with secondary school teaching qualifications were first taught at the University of Stirling in 1968. The overall course structure was one of concurrent academic and professional studies and from the outset it was planned that microteaching would form a component part of individual courses. A five year research project (funded by the Leverhulme Trust) was commenced in 1969 "to evaluate the contribution which microteaching could make to the preservice professional education of secondary school teachers" (McIntyre et al., 1977; p.11). This study is one of several projects which attempted to respond to this stated objective. Other projects have been reported in McIntyre et al. (1977).

Initially developed at Stanford University, microteaching programmes attempted to resolve several issues facing teacher educators. Training programmes constantly searched for an effective balance between theoretical studies and professional practice. This balance reflects a concern for the student's practical competence in the task of classroom teaching and with their ability to demonstrate understanding of the teaching-learning process, and factors which affect it.

The introduction of microteaching is described in Chapter I of the present study, together with a review of the available research relating to the general effectiveness of microteaching, and to variables operating within microteaching programmes. This discussion leads to a statement of the purposes of the present study and the

hypotheses to be tested in the Stirling situation.

The research focussed primarily upon teacher questioning behaviours practised in microteaching and in school classrooms, and took account of both teacher behaviours and pupil response behaviours associated with the teacher questions. With the development of a minicourse on questioning behaviours at the Far West Laboratory for Educational Development (Gall et al., 1971) an opportunity was provided to compare the effectiveness of these materials with the programme already operating at Stirling. Chapter II describes the development of a lesson analysis instrument to measure the relevant teacher and pupil behaviours and indicates the steps taken to establish the reliability of this instrument prior to its use in the main experimental programme. Given the different formats of the normal Stirling programme and the introduced minicourse programme it was advisable to gauge student and staff reaction to this innovation and questionnaires were designed for this purpose.

The three experimental stages of the study are set down in Chapter III including, in each case, details of the methodology employed and the teaching programmes. Chapters IV and V present the results of the experimental programme. Chapter IV provides a full analysis and discussion of the results relevant to the teacher questioning and pupil response behaviours concluding with a testing of the hypotheses nominated for the study. Chapter V reports, and interprets, the results of the questionnaires administered to participant student teachers and staff members.

In the final chapter, the findings of the present study are

outlined, and a consideration of the implications of these findings is presented against the background of relevant recent research.

CHAPTER 1
MICROTEACHING, MICROTEACHING PROGRAMMES, AND
THE PRESENT STUDY

The Introduction of Microteaching

Developed at Stanford University in 1963, microteaching sought to overcome some of the limitations of traditional programmes in teacher education. Usually, such programmes were based on two major elements, one theoretical and the other practical. The theoretical element included foundational studies in philosophy, psychology, and sociology, as well as specialist subject areas which would eventually become the major teaching subjects. The practical element normally occurred in a school setting and included observation and practice of teaching under the general supervision of an experienced teacher. The practice teaching was based upon an apprenticeship pattern of training. By observation of the master teacher and practice under supervision, it was expected that the student teacher would acquire the skills appropriate to effective teaching (Stones and Morris, 1972).

It was anticipated that the theoretical aspects of the course would form the fundamental basis for practice (Gage, 1963). However, suggestions have been constantly made that such a translation was rarely achieved.

Bush (1968) described the situation as theoretical discussions followed by an ordeal by fire. Morrison and McIntyre (1969) stated that "theoretical courses are not about teaching, and methods courses, which are about teaching, have no theoretical foundations" (p.59). Rosenshine (1971), reviewing the few studies in the area of

teacher preparation, concluded that "the major question raised . . . is . . . whether the teacher preparation is related to classroom practice" (p.208).

Specific elements of practice teaching were questioned. Hatton and Owens (1971) spoke of the classroom lesson as being "diffuse in its demands on instructional skills and tenuous in its realization of well intentioned advice from supervisors" (p.5).

Smith et al. (1969) were critical of conventional practice teaching at several points:

at best student teaching is a reality from which the trainee learns by trial and error and a minimum of feedback. The situations that arise in his teaching are fleeting in tenure and can be discussed only in retrospect. He cannot work through the situation again to correct his behaviour because classroom work moves rapidly from situation to situation, and no situation can be reinstated for the practice of a technique. (p.70).

Berliner (1969) listed four reasons offered by the Stanford researchers in concluding that their intern teacher training programme of the early 1960s was inadequate:

- (a) it placed the novice teacher in a situation where both "good" and "bad" teaching behaviour occurred;
- (b) the novice had to decide for himself, without an experienced supervisor close by, what teaching behaviours should be emulated; sometimes poor teaching habits were learned, and sometimes the significance of certain exemplary behaviours was missed;
- (c) there was little opportunity for immediate practice of those teaching behaviours deemed important;
- (d) observation sessions were often time consuming, hard to schedule, occasionally boring, and frequently expensive for the novice who had to view classes in a co-operating school far from campus. (p.1)

It was therefore hardly surprising that proposals for change were developed. The probable direction of the change was also evident.

In the early 1960s, reported research into teaching (Barr et al., 1961; Ryans, 1960) and reviews of research into

teaching (Gage, 1963) were riddled with the term "effectiveness". Generally measures of effectiveness had been based upon the total act of teaching. Commenting on the continuing state of uncertainty regarding criteria of effectiveness, Gage (1963) proposed that a possible solution might be

the development of the notion of "micro-effectiveness". Rather than seek criteria for the over-all effectiveness of teachers in the many, varied facets of their roles, we may have better success with criteria of effectiveness in small, specifically defined aspects of the role. Many scientific problems have eventually been solved by being analyzed into smaller problems, whose variables were less complex. (p.120)

Morrison and McIntyre (1969) noted the complexity of activity always evident in a classroom and suggested that "a student beginning to learn how to teach cannot give his attention to more than a small part of it" (p.61).

Discussing difficulties in the training of teachers, Flanders (1963) called for the description of teaching in terms of a series of acts, and the establishment of models of behaviour appropriate to different kinds of teaching situations.

Applied psychological research into learning in the 1960s was involved with two fundamental elements of behavioural learning theory: programmed instruction and task analysis. Notions of reinforcement put forward initially by Thorndike (1913) were followed by Skinner (1954) and other behaviourists such as Mager (1961) and Gagné (1962). These ideas were applied in training systems associated with complex machinery. Critical tasks in job performance were identified and emphasized in training, while tasks unrelated to job efficiency were discarded. Evaluation of performance was based upon the critical tasks or criterion behaviours and was clearly visible to both teacher and learner. Berliner (1969) concluded that

"these techniques could clearly be applied to the performance of teaching" (p.4).

Such an application was described by Peck and Tucker (1971) as a systems approach and involved a series of steps:

1. precise specification of the behaviour which is the objective of the learning experience;
2. carefully planned training procedures aimed explicitly at those objectives;
3. measurement of the results of the training in terms of the behavioral objectives;
4. feedback to the learner and the instructor of the observed results;
5. re-entry into the training procedure;
6. measurement again of the results following the repeated training.

A similar pattern could be identified in the microteaching programmes at Stanford University. The specific behaviours were identified through an informal task analysis of teachers in their classrooms (Cooper and Allen, 1971) and became known as the component or technical skills of teaching. The training procedures included two phases: instruction in the objectives and uses of a particular skill, usually associated with observation of a videotape of a teacher using the skill; and planning and teaching of a lesson with the teacher concentrating on the use of the skill. Evaluation (measurement) and feedback were provided by supervisor, pupils, and usually from a videotape recording of the lesson. The teaching cycle was then repeated with a different class and feedback was again provided.

Initially offered over a period of two months to new graduates preparing to assume full teaching responsibilities in a school (Allen and Clark, 1967), microteaching was described in a publication titled (in part) "A New Design for Teacher Education" as a scaled down teaching encounter - "scaled down" because it involved a reduction in subject matter attempted, size of the class, and time spent in the practice situation (Allen, 1966).

Variations in the definition of microteaching appeared in the literature, and these related to the perceived degree of similarity between microteaching and regular classroom practice.

The Stanford team regarded microteaching as "real" teaching (Allen and Ryan, 1969; Cooper and Allen 1971; Berliner, 1969). Elsewhere Allen (1966) described microteaching as a realistic approximation to classroom conditions; similarly, Bjerstedt (1968) used the term "structured realism". McAleese and Unwin (1971) believed it was a form of simulated teaching; Cooper and Allen (1971) agreed with this if peers were used as the "class pupils". Perlberg (1969) admitted to elements of simulation in concluding that, whilst not being a substitute for the real classroom experience microteaching is the next best approximation of this reality. McPherson (1971) disputed references to a simulation situation by stating that the difference between microteaching (and presumably classroom teaching experiences) and simulation was the lack of reproducibility of the training situation in microteaching.

Generally these variations merely reflected different purposes and resources of the user, and overall the format developed at Stanford for the microteaching experience was followed elsewhere.

The first skill (set induction) used in the Stanford programme was introduced in a study reported by Aubertine (1964). The practice of focussing on this one skill in the microteaching lessons was found to be quite effective, and from this point the "identification" of further skills was pursued. Bush and Allen (1966) described the identification of nine specific teaching skills, "the importance of which seems to be commonly agreed upon by experienced teachers" (p.1). Berliner (1969) stated that the "initial technical skills were drawn from events noted in a somewhat haphazard examination of secondary classrooms" (p.50). Allen and Ryan (1969) reported 14 skills "representative of the skills . . . we have tried to develop in our teacher candidates . . . (applicable) at many levels, for teaching many different subjects" (p.15). The development of skills, they said, was "not made in (the) light of any set of rules about what good teaching consists of or what teachers need to know, but resulted from discussions and debates of the microteaching staff" (p.14).

In somewhat shaky fashion, this approach appeared to have followed a particular concept of the nature of teaching proposed by Gage (1964), that "if everything a teacher does qua teaching is teaching, then teaching consists of many kinds of activity" (p.275). For microteaching the central assumption must be that the acquisition of a variety of individual skills considerably assisted and accelerated the development of the beginning teacher's expertise in the whole class situation.

Research Evidence Prior to the Present Study

As a prelude to a statement of the purposes of the present study, relevant research studies are reviewed under three major headings:

- .. studies relating to the general effectiveness of microteaching.
- .. studies relating to variables within the microteaching format.
- .. studies relating to teacher questioning.

STUDIES RELATING TO THE GENERAL EFFECTIVENESS OF MICROTEACHING

In the period prior to this study, most reports on microteaching were mainly descriptive, and caution must be exercised in the interpretation of these studies. It would appear straightforward to relate the conclusions of one study to another or several others. However, frequently the experimental design and method of assessment of results of different studies were so different as to make suspect such a procedure. The problem may be exemplified in relation to two often quoted studies.

Allen and Fortune (1966) randomly divided students training to be secondary teachers into two groups, one group participating in a microteaching programme for 10 hours per week over 8 weeks, the other, a control group, taking part in a school practice experience occupying 25 hours per week for the 8 weeks. Post-training performance was assessed in the microteaching situation, using the Teacher Demonstration Rating Scale. The microteaching group was found to perform at a significantly higher level of teaching competence.

A later study by Kallenbach and Gall (1969) has been described as a replication of the Allen and Fortune (1966) work, and some importance was attributed to the fact that the findings of the two studies appeared to contradict each other, in that Kallenbach and Gall

(1969) found no significant differences between the microteaching group and the school experience group. In fact, any conclusion based upon the overlap between these studies must be regarded with some doubt because the design and assessment procedures of the later study varied from the earlier study in important ways:

- (a) The student teacher population in the Allen and Fortune (1966) study was composed of graduate interns training to be secondary teachers. The Kallenbach and Gall (1969) population was training to be elementary school teachers.
- (b) As noted, student teacher performance in the Allen and Fortune (1966) study was assessed immediately after the training programme in the microteaching situation using the Teacher Demonstration Rating Scale. Kallenbach and Gall (1969) assessed performance pre- and post-treatment in the microteaching situation, and in the school classroom immediately after the training programme, and again one year after the training programme. The assessment instruments used in this case were the Stanford Teacher Competence Appraisal Guide and the Instrument for the Observation of Teaching Activities.
- (c) Further confounding of variables occurred within each of the studies.

Supervisors and pupils in the Allen and Fortune (1966) study were paid volunteers, and both groups had had previous experience in microteaching situations.

Kallenbach and Gall (1969) provided little evidence of the actual work undertaken by their experimental microteaching group or control group, so that it is impossible to tell how far the

experiences of these groups, or the differences between their experiences, were comparable with those for the corresponding groups in the Allen and Fortune study. Within the defined treatments, there is clearly considerable scope for potentially influential differences.

As might be expected, many studies have discussed the effectiveness of microteaching in the development of teaching skills.

Reports on the early Stanford programmes have been made by Aubertine (1964), Allen and Fortune (1966), Fortune et al. (1967), Cooper and Stroud (1966), and Cooper and Allen (1967). Effectiveness was measured in terms of the gain in teacher competence between the commencement and conclusion of the microteaching sessions. Generally changes in teacher behaviour were reported to be consistent with programme objectives.

Initially, measurement of the effects of the training was made by instruments which had been designed to assess overall teaching competence.

e.g. Aubertine (1964) used the Stanford Microteaching Appraisal Guide (SMTAG);

Allen and Fortune (1966) used the Teacher Demonstration Rating Scale (TDR);

Fortune et al. (1967) used a revision of the TDR called the Stanford Teacher Competence Appraisal Guide (STCAG).

STCAG was a global scale of seventeen items, thirteen relating to classroom-based teacher characteristics and four relating to community and professional characteristics. Allen (1967) argued that this instrument was unsatisfactory in measuring the

specific teaching skills included in the microteaching programmes. Cooper and Stroud (1966) developed and used new instruments which focussed upon the teaching skills of the programme. However, whilst apparently more appropriate for the purpose than global measures, the validity and reliability of the new instruments had not been established prior to their use (Cooper, 1967).

More recent evidence for microteaching has come from the work of Borg and his colleagues at the Far West Laboratory for Educational Research and Development (Borg et al., 1970). Borg produced packaged courses (called minicourses) based upon the requirements for an efficient specific teaching skills programme set down by McDonald (1969). A phase presenting the skill, generally in written materials and visually, was followed by a practice phase and feedback phase. The courses were initially designed as in-service training programmes and a rash of studies was associated with various stages of the production of the range of minicourses (Borg et al., 1970; Gall et al., 1970, 1971; Langer, 1970; Acheson and Tucker, 1971; Acheson and Zigler, 1971; Shea, 1971). Overall, microteaching was shown to be an effective technique for bringing about a change in teacher behaviour. In common with the early Stanford research, these studies usually adopted crude gain scores as the criterion measure. Designs depending on gain scores have been criticized on several grounds, including the danger of distortion through floor and ceiling effects, the accumulation of errors of measurement, and the lack of control over extraneous factors. Cronbach and Furby (1970) suggest instead the use of methods such as the analysis of variance of post-test results following random allocation to treatments.

Although microteaching was originally developed as a complement to classroom teaching experiences (Allen and Clark, 1967), the effects of microteaching programmes have frequently been contrasted with more traditional methods of teacher education. It has already been noted that the microteaching group in the Allen and Fortune (1966) study performed at a higher level of teaching competence than the control group given a conventional observation and classroom teaching programme. Kallenbach and Gall (1969) found no significant differences in their replication of this study, but both studies claimed that the microteaching performances were reliable predictors of subsequent performance in classroom teaching. Allen and Clark (1967) reported superiority of students trained in a microteaching clinic in the skills practised and overall teaching competence. Goodkind (1968) found an experimental microteaching group to be superior to a conventional group in teaching techniques, pupil relationships and lesson planning. Harris et al. (1970) studied science classrooms and measured a range of criteria involving teachers and pupils, and it was claimed that microteaching promoted "student growth" in these areas. Legge and Asper (1972) compared the abilities of a microteaching group and a conventional group to evaluate a videotaped lesson, using the categories of the STCAG relating to lesson aims and planning and teacher performance. The microteaching group performance was superior to the other group, and their level of evaluation was comparable to that of a group of master teachers who also evaluated the lesson.

Studies comparing a combination of microteaching and regular classroom teaching with classroom teaching experiences only were

performed by Young and Young (1969) and Jensen and Young (1971). The former demonstrated the superiority of a group including microteaching as part of its programme in several specific teaching behaviours and in the use of alternative teaching patterns. The latter also showed the microteaching group to be superior, this time on measures of general teaching characteristics.

In contrast to the relatively large numbers of somewhat unsatisfactory studies on "gains" from microteaching and of "system" studies comparing microteaching with classroom teaching experience, there have been few studies directly concerned with either of two simple but fundamental issues: whether or not the practice of teaching skills in microteaching contexts contributes significantly to the acquisition of these skills; and whether or not the skills which student teachers manifest in microteaching contexts are transferred to their teaching in normal classroom contexts.

In a programme designed to improve verbal teaching behaviours Davis and Smoot (1969) used two treatment groups, one participating in a microteaching programme and the other taking a guided reading and discussion programme with no direct teaching experience. Morse and Davis (1970) used two similar treatment groups for a programme on questioning behaviour. In both cases, the microteaching group showed superiority in relation to the majority of variables measured.

Bartley (1969) reflected on the potential of microteaching against a set of principles described by Ellis (1969) for the transfer of learning. Prime considerations assisting the transfer from one situation to another included the extent and frequency of practice of a specific task in the training programme, the degree of similarity between the original task and the transfer task, the

background experiences of the individual and the degree of understanding of the principles incorporated in the particular task. Against these criteria, Bartley (1969) supported the contribution of microteaching as a preliminary to classroom teaching. Berliner (1969) was less positive and whilst advocating the "need to examine the nature of transfer" yet said, "Through concern for reducing the complexity of the classroom . . . a situation yielding little transfer effect to the classroom may have been produced" (p.50).

Research evidence directly concerned with transfer was sparse. Those comparative studies and pre-test - post-test studies which have based criterion measures on teaching in normal classroom contexts (e.g. Borg, 1970) provide some implicit evidence on transfer; but except where criterion measures have been made in both microteaching and classroom contexts, it is never clear to what extent the use of specified teaching skills in microteaching is sustained in classroom contexts. A further difficulty arises from the instrumentation used in transfer studies, with the instruments and criterion measures used in classroom contexts commonly being different from those used in the corresponding microteaching contexts (e.g. Brashear and Davis, 1970; Britton and Leith, 1971). Both of these studies emphasized the need to develop school practice observation and feedback instruments which related to skills practised in microteaching. Progress in this direction has been reported by White (1972).

Thus direct evidence of the transfer of specified skills from microteaching to classroom contexts is available from very few studies (Borg, 1968; Kallenbach and Gall, 1969).

Overall, in the area of transfer the conclusion reached by

Berliner (1969) seemed appropriate.

effort should be made to determine the magnitude of transfer from artificial micro environments to real macro environments. Furthermore, some skills are defined in terms of behaviour observable in the natural environment, teacher use of particular skills can be measured and related to student behaviour in school settings. Without this kind of information it is not known if training teachers in specific teaching skills is an academic exercise or a program having genuine impact on education. (p.50)

Stones and Morris (1972) pointed out that a relationship had not been established between student attitudes and student teacher performance, but as a bare minimum they suggested "in the absence of evidence that positive student attitudes are deleterious to student performance, that student acceptance of training methods is greatly to be desired" (p.96).

A comprehensive measure of student teacher attitudes following microteaching experiences was conducted by Ward (1970). He surveyed 141 teacher training institutions and found a high level of acceptance of the value of microteaching. The six most frequently reported changes in attitude were, in order:

1. greater understanding of the teaching process as a complex, challenging profession;
2. greater interest in and enthusiasm for towards education;
3. increased self confidence;
4. greater concern for self-improvement and self-evaluation;
5. greater awareness of teaching image;
6. greater awareness of specific skills of teaching.

Student acceptance of the Stanford microteaching programmes has been reported by Allen and Fortune (1966) and Fortune et al. (1967).

Student reactions have also been noted by Webb and Baird (1968), Goldman (1969), Turney (1970), Perrott and Duthie (1970), Gregory (1970) Limbacher (1971), and McIntyre and Duthie (1972);

and in all these studies a clearly positive reaction was offered to microteaching as a relevant training procedure.

STUDIES RELATING TO VARIABLES WITHIN THE MICROTEACHING FORMAT

In putting forward a model for teacher training, Claus (1969) modified previous work by Glaser (1962) and McDonald (1965) and proposed that the instructional procedures of a microteaching programme could be grouped into three stages:

- (a) a presentation phase, in which the student teacher was given guidance in the behaviour to be learnt;
- (b) a practice phase in which the student attempted to perform the behaviour; and
- (c) a feedback phase providing the student teacher with information regarding the degree of success of his practice of the behaviour.

A sequence of these three stages constituted the familiar teach cycle of a microteaching programme, and the reteach cycle was merely a repetition of the latter two stages.

These three stages provided a convenient basis for the review of research studies relevant to the variables of the microteaching format.

Presentation Phase

The most usual method of introducing students to teacher behaviours was some form of modelling or learning-by-imitation.

The theoretical rationale for using models came from several sources. McDonald and Allen (1967) acknowledged the work of Miller and Dollard (1941) and of Mowrer (1960). Miller and Dollard (1941) put forward a theory that observational learning was contingent upon the

administration of reinforcing stimuli either to the model or the learner. Mowrer (1960) distinguished between two types of imitation learning. In one case the learner was directly reinforced, and in the second case the learner experienced indirect reinforcement by observing model behaviours which were reinforced.

In addition, Bandura and Walters (1963) considered that the acquisition of imitative responses could best be accounted for by the contiguity theory developed by Sheffield (1961). This theory suggested that a student might acquire "through the contiguous association of sensory events, perceptual and symbolic responses possessing cue properties that are capable of eliciting at some time after demonstration, overt responses corresponding to those that have been modeled" (McDonald and Allen, 1967, p.10). Following this line, Bandura and Walters (1963) proposed that complex social behaviour could be almost entirely acquired through imitation, and that the provision of face-to-face models accelerated the learning process. Other work by Bandura et al. (1963) expanded this statement by showing that filmed models were as effective as real life models in transmitting behaviours.

Applied to teacher education, and to microteaching, these principles suggested the need for opportunities for the student teacher to observe specified teaching behaviours, and for the introduction of reinforcement when the behaviours were observed or practised.

General evidence that the use of models of teaching facilitated student learning has been frequently reported, in McDonald and Allen (1967), Koran, J.J. (1968; 1969), Koran M.L. (1969), Koran, et al. (1971), Lange (1971), Goodwin (1972), and Alper et al. (1972).

Much research has explored the differential effectiveness of two basic types of modelling, perceptual and symbolic. In perceptual modelling a film or videotape of a teaching sequence was viewed by the student. Symbolic modelling, by comparison, was in written form. Stones and Morris (1972) further subdivided symbolic modelling into two forms, one being a written transcript of a teaching sequence and the other a written description of a teaching behaviour.

Studies comparing a written transcript form of symbolic modelling with perceptual modelling provided little clear evidence for the superiority of one format over the other, although both formats led to improved student performances (Allen et al., 1967; Berliner, 1969; Koran, J.J., 1971). At slight variance with this view, a study by Koran M.L. (1969) showed both perceptual and symbolic model groups superior to a control, with the perceptual group consistently more effective than the symbolic one. It should be noted that each of these studies centred upon some aspect of teacher questioning behaviour. Berliner (1969) regarded this factor as possibly vital in suggesting that "for a verbal skill . . . the video technology used to present the model may be superfluous, . . . training may be as readily accomplished through written models" (p.23).

When a written description of the teaching behaviour was used as symbolic modelling and this was associated with perceptual modelling, then such a treatment has been found to be superior to the provision of the symbolic modelling alone (Orme, 1966; Koran, J.J., 1968; and Young, 1969).

McDonald and Allen (1967) studied the interaction effects of modelling and feedback, and they concluded that perceptual modelling together with supervisor feedback augmented by audiotape was the most effective condition. Orme et al. (1966), Orme (1966), Claus (1969), and Ebert (1970) reported cueing methods which made aspects of the behaviour to be learned more salient to the learner during the presentation of the behaviours. Young (1968; 1969) compared two methods of focussing the attention of viewers on the critical behaviours being modelled. One method used auditory and/or visual cues in the videotape; the other took the form of written directions and an explanation of what to look for in the model. The former method proved significantly more effective. Brusling (1972) used "an auditory cue" or "short beep" to indicate critical behaviours. Non-significant results were achieved which might be explained by the fact that he did not differentiate among the various sub-categories of behaviour being presented.

As a slight variation to cueing procedures during the presentation of a model, several studies included some student activity at this stage. Generally this activity was not studied as a variable of the research design. Popham (1966) advocated the usefulness of students identifying occurrences of the desired behaviour. Borg et al. (1970) and Koran, J.J. (1970) both included questions as part of the presentation to focus attention on specific behaviours and to check on understanding. Similar objectives were evident with the use of ratings of effectiveness (Emmer and Sullivan, 1969), and observation schedules (Brusling, 1972). Bjerstedt (1967) used a critical incident approach. In this study the perceptual model was halted at certain points and the student asked to respond and react to the situation presented.

Further evidence on modelling available from individual studies suggested that positive models focussed on the desired behaviours were generally more effective than negative models. Some encouragement was given to the use of negative models as a problem source to the student from which positive examples of the behaviour might be constructed. Koran, J.J. et al. (1972) and Allen et al. (1967) compared the use of positive models with models including both positive and negative examples of behaviour. Both treatments resulted in student gains being made, with the "positive only model" group achieving a superior performance.

Successful modelling materials have concentrated on specific behaviours rather than on more general samples of teaching (Emmer and Sullivan, 1969). Rather than using practising teachers in real classrooms, Borg et al. (1970) preferred the use of actors working to a script which highlighted the desired behaviour.

Koran, J.J. et al. (1972) contrasted models which included examples of teacher behaviour only, pupil behaviour only, or teacher-pupil interaction, and concluded that pupil behaviour was vital to the instructional effectiveness of the model. Probably the demonstration of relevant pupil behaviour provided purpose and context for the teacher behaviour and as well served as a form of vicarious reinforcement to the observer.

Several presentations of the perceptual model have been found effective by Bickel (1970), Lange (1971), Koran, J.J. (1971), and Kissock (1971). On the other hand, Murray and Fitzgerald (1971) found that "three minutes of tape modelling per specific behaviour" produced significant effects.

Finally, attempts have been made to identify differential effects of modelling procedures on individual members of student groups. Prior to the random assignment of students to one of three modelling treatments, Koran M.L. (1969) administered tests involving verbal and perceptual abilities. Several significant aptitude treatment interactions resulted, but the trends were not consistent.

Practice Phase

The practice phase of microteaching has not attracted the same level of research activity as the presentation phase or the feedback phase. Variables which have been considered in this phase included

- (a) the size and composition of the class used in the microteaching lessons;
- (b) the distribution of the practice sessions.

As part of the "essential propositions" associated with microteaching, the size of the class was usually reduced to about five pupils in order to minimize "the complexities of normal classroom teaching" (Allen and Ryan, 1969,p.2). One study which varied the size of the class used in microteaching lessons (Staley, 1970) concluded that the number of pupils in the class (in this case 4, 8, 12, or 16 peers) had no significant effect on the trainees' subsequent teaching behaviour. An unresolved issue in this area would appear to be the extent to which behaviours practised in the microteaching lessons with five pupils survive the transfer to a normal classroom with 25 or 30 pupils.

Controversy about the definition of microteaching as either real teaching or simulation or role playing has often centred on whether the class used in the microteaching lessons was made up of student

peers or by pupils derived from school situations (Cooper and Allen, 1970). Microteaching at Stanford initially had students teach lessons to groups of their peers, but in the face of negative student reaction this procedure was altered and lessons were taught to groups of school pupils.

Later clinics advertised for, and paid fees to, pupils involved in microteaching lessons (Allen and Ryan, 1969). Ward's survey of secondary teacher-education programmes in the United States (1970) revealed that peers were used considerably more frequently than school pupils in microteaching lessons.

The results of research studies based upon this variable were fairly inconclusive. Superior student teacher performance with peer groups was reported by Young et al. (1971). The research of Steinbach and Butts (1968) and Wood and Hedley (1968) supported the use of school pupils. Non-significant results were found by Colofello et al. (1969), Hoerner (1969), Johnson and Pancrazio (1971) and Patrick (1972). Student teachers stated their personal preference for teaching school pupils rather than peers in studies by Wood and Hedley (1968), Colofello et al. (1969), and Gregory (1971).

The stated purpose of providing for a second teaching and feedback experience or reteach cycle in a microteaching programme was to afford an immediate opportunity to rectify errors made in the initial teaching experience and to follow through suggestions made in the feedback session (Allen and Clark, 1967; Cooper, 1967). The rationale offered for this was that students would experience dissonance when the analysis of their own behaviour showed it to be discrepant with the ideals brought out in the feedback sessions.

Modification of the initial behaviour was then promoted by the drive for consonance (Birch, 1969).

Considerable variation has been reported in the teach-feedback-reteach structure of microteaching programmes. Ward's survey (1970) found that only one quarter of his respondents regularly used the complete teach-reteach cycle. In the first Stanford programmes the reteach followed immediately after the feedback session. The 1966 clinic allowed for a fifteen-minute interval for replanning (Cooper and Stroud, 1967), and the 1967 clinic allowed an even longer period of 24 hours to elapse between initial feedback and reteach. The inclusion of time gaps between the two teaching lessons has led researchers to question whether the advantages of allowing time for replanning might not be offset by the disadvantages of the student forgetting aspects of the desired behaviours. Berliner (1969) concluded that separated teaching sessions "normally result in better acquisition of behaviour and more resistance to extinction" (p.52). Ward (1970) suggested that personal anxiety and tension arising out of the initial teaching lesson and feedback might be dissipated during a time delay before the reteach lesson and consequently lead to an improved student teacher performance.

Overall, no clear evidence has been gathered to indicate an optimal period between feedback and reteach sessions. Ausubel and Robinson (1969) supported the separation of the teaching sessions for both learning and retention but suggested the most appropriate separation time would vary between individuals and according to the nature of the learning task.

Feedback Phase

From its inception, the microteaching structure has always incorporated some element of feedback, making available to the learner some information about his performance. The acknowledgment of the importance of feedback in the learning process comes from sources outside the teacher education context - "The results of decades of learning research demonstrate that feedback is a prime factor in learning skills." (Borg et al., 1970, p.42).

Feedback could facilitate learning through selective reinforcement or more generally by providing knowledge of results (Gagné and Bolles, 1963; Ausubel and Robinson, 1967; McDonald and Allen, 1967). However, as McDonald and Allen went on to say, "in a complex learning task such as learning a teaching behaviour, the relative effectiveness of feedback may be highly dependent on the kind of feedback provided" (p.13).

Early studies of microteaching techniques seemed to conclude that the most powerful combination of feedback variables was videotape replay of the teaching session with supervisor comments (Acheson, 1964; Olivero, 1965; McDonald and Allen, 1967). The findings of later studies were not always in agreement with this conclusion, and it no longer was possible to make definitive statements about the best kind of feedback to use in the microteaching context. The focus of research has been on videotape versus audiotape replay (technical feedback), and supervisory conference versus self-analysis (inter-personal feedback).

Videotape and Audiotape Replay

By the end of the 1960 s, videotape feedback was being widely used in microteaching programmes in America. Ward (1970) found that 59 percent of institutions used videotape more than 75 percent of the time, whereas only 5 percent of institutions used audiotape more than 75 percent of the time. The purported advantages of videotape were that it provided complete, immediate, and objective feedback.

Leonard et al. (1971) found that trainees who received supervisory critiques plus videotape replays made significant gains, while those who received supervisory critiques plus audiotape replays made gains that were positive but not significant. Perlberg (1970) felt that audiotapes excluded certain elements of the teaching session and could lead to a biased interpretation of the lesson. In contrast to the earlier studies, some researchers found that there was no significant difference between groups receiving feedback with and without videotape replays (Hoerner, 1969; Doty and Cotrell, 1971), or between groups receiving audiotape and videotape feedback (Klingstedt, 1970; Gall, 1971). The latter study did report an expressed student preference for videotape.

Some studies produced results which favoured the use of audiotape over videotape feedback. Shively et al. (1970) reported that audiotape feedback brought about greater behavioural change, although both audiotape and videotape replays were highly valued by participants. Ward (1970) found that in the use of probing questions the audiotape feedback group made gains, while the videotape feedback group regressed. This result led him

to state, "Apparently the necessity to listen intently without visual concentration provides stimulation sufficient to affect the questioning skill ability of teachers. It is possible that audiotape recorders are grossly underrated" (p.93). Acheson and Tucker (1971) compared two instructional treatments for groups undertaking a programme on "Higher Cognitive Questioning" (based on Minicourse 9), and found that the audiotape feedback group performed at least as well, and sometimes better, than the videotape group.

The evidence was confusing, and failed to produce a reliable guide for the choice of an appropriate technical feedback instrument. It was possible that audiotapes were appropriate when the skills to be learnt had a verbal emphasis, and videotapes when the skills had a visual element.

Supervision

Supervision was accepted as an integral part of the teaching practice component of teacher training (Acheson, 1964). Its usefulness in microteaching practice was not so well established; again, as with the issue of feedback, no clear pattern emerged from research studies. McDonald and Allen (1967) concluded that supervision in the form of reinforcement and cue discrimination produced better results than self-analysis. The study of refocusing behaviours by Morse et al., (1970) showed a significant increase in the occurrence of the behaviours in the group which included a supervisory conference in the feedback phase of its experimental treatment.

Some contrary evidence was brought forward by Claus (1969), who found that supervisor cueing of the trainee's use of higher order questions during the feedback phase had no significant effect,

although it was important in the modelling stage. Harrington (1970) found no differences between self-analysis and feedback from supervisors or peers. Tuckman and Oliver (1968) found that supervisory feedback led to negative change in trainee behaviour, while pupil feedback led to positive change. However, supervisors in this study were school principals not college personnel, and the criterion was change in pupil ratings. Consideration of background information such as this indicated the difficulties entailed in making direct comparisons between research reports on supervision. Studies were often carried out in widely differing contexts in regard to teaching situation, skills to be learnt, and the nature of the supervision provided.

Little research investigation has been undertaken into the effectiveness of different styles of supervision. Johnson (1967) conducted a pilot study of different types of supervisory behaviour over three teaching skills. One of the skills showed differing shifts in behaviour for the three supervisory types. Joyce (1967) in an investigation of feedback effects concluded that supervisors in teacher training programmes needed extensive training in giving effective and constructive feedback to students.

Borg et al. (1970), in reviewing studies on supervision, pointed out that many of the studies which have not found a difference between supervisory feedback and other types of feedback have used a frequency of occurrence criterion rather than focus on the appropriateness of the occurrence. Although Borg decided, when developing the first series of minicourses, that supervisory feedback was unnecessary when modelling and

videotape feedback were incorporated in the microteaching sequence, they did not discount the possibility that some form of supervision would be included in later minicourses.

STUDIES RELATING TO TEACHER QUESTIONING BEHAVIOURS

The dependent variables in this study included a range of specific teacher questioning and pupil response behaviours. Teacher questions might be regarded as a fundamental component of classroom behaviour (Flanders, 1970). The teacher question was a direct means of communication and at the same time a format for setting pupils tasks.

Direct evidence linking specific teaching behaviours to pupil achievement has generally been inconclusive (Rosenshine, 1971; Rosenshine and Furst, 1971), and teacher questioning behaviour was no exception in this regard.

Commonly analyses of classrooms have revealed that about one-sixth of classroom interaction time is taken up by teacher questioning behaviours (Furst and Amidon, 1967; Furst, 1965). Rosenshine (1971) summarized studies which had investigated the relationship between frequency of questioning and pupil achievement. Three studies (Soar, 1966; Wallen, 1966; and Connors and Eisenberg, 1966) reported a significant positive relationship whilst five studies reported by Flanders (1970) found no significant relationship.

In a classic study Stevens (1912) found that in high school classes two-thirds of the teachers' questions were concerned primarily with the recall of facts. This heavy emphasis upon memory, information, and facts was also found in later studies such as Floyd (1960), Gallagher (1965), Davis and Tinsley (1968), and Gall (1970).

Several recent studies have concentrated upon the teacher use of questions described as higher order questions which cannot be answered purely from memory or simple description, or questions to which there is no "right" answer (Allen et al., 1969; Borg et al., 1970).

Strong evidence was provided that the cognitive levels of pupils' contributions in discussion were closely related to the cognitive demands contained in the teacher questions (Davis and Tinsley, 1968; Mood, 1972; Murray and Williams, 1971; Wood, 1970; Hudgins and Ahlbrand, 1967). Studies by Nuthall and Lawrence (1965) and Tisher (1970) suggested that such a positive relationship required the teacher to be able to identify appropriate occasions for the use of a higher order question.

Confusing and contrary results have been reported from studies investigating the relationship between higher order questioning and pupil achievement. Rosenshine (1971) suggested the confusion was partly a consequence of variations in classification systems, operational definitions, and coding procedures. Hunkins (1967, 1968) found that pupils who had been subjected predominantly to higher-order questions scored significantly higher on a post-treatment test than pupils questioned predominantly at the factual recall level.

Rogers and Davis (1970) found no significant relationship between the use of higher order questioning and pupil achievement. Significant negative relationships were reported by Tisher (1970) and Ragosta et al. (1971). In both cases the relationship applied only to pupils of low ability. Wright and Nuthall (1970) also reported a negative relationship from a study with pupils taught

by open-ended questioning. Pupil responses to these questions were regarded as more ambitious but not well-founded in regard to factual content.

That teachers continued to use questions as an important mechanism of contact with their pupils was not in doubt. Analyses of classroom interaction revealed that teacher questions stressed factual recall, with little emphasis being given to questions seeking to develop higher cognitive processes.

Relationships between the asking of questions, the nature of the question, the actual or anticipated pupil response to the question, and pupil achievement have not been firmly established. In spite of this teacher educators and curriculum designers maintained the importance of questions in general and higher order questions in particular as essential elements of teaching strategy. This assumption is accepted in the present study to the extent that the investigation is concerned with factors influencing student teachers' acquisition of certain questioning behaviours.

The Present Study

The present study was designed to throw light on some of the issues which a review of previous research appeared to show to be unresolved, which seemed of considerable practical and theoretical importance, and which it was possible to investigate in the Stirling context.

The empirical data for the present study was provided by students and staff participating in education courses within the Department of Education at the University of Stirling.

Objectives for these courses were listed as follows:

- that on the completion of training, students should be competent secondary school teachers of one or two related disciplines.
- that students should be able and inclined to analyze their teaching as a deliberate and purposeful activity.
- that students should have at their disposal a conceptual framework for the diagnostic assessment of teaching and that they should be able to use this framework to identify limitations of their initial skills and strategies, thus being able to develop new patterns of behaviour appropriate to the situations in which they find themselves teaching.
(Perrott, 1972, p.2)

Consistent with these objectives the degree course was made up of concurrent academic and professional studies and organized into two parts. Part I was taken over three semesters with an introductory education course in semester 3. Part II, which involved three semesters for general degree students or five semesters for honours students, included education studies in semesters 4, 5, 6 and 7 (University of Stirling, Department of Education, The Present Education Courses. Mimeograph, (undated)). Practice teaching experiences were provided in two ways. The education courses in semesters 3, 4, and 5 were designed around microteaching experiences. As well, conventional teaching practice periods occurred between semesters 3 and 4, also between semesters 5 and 6, and for a six-week period during the final semester.

The semester 3 course focussed on the microteaching practice of five behaviours or skills of communication and instruction. Each behaviour was introduced by a lecture and seminar programme which attempted to provide a theoretical rationale for the selected behaviours, together with an explicit description of the behaviour

as a teaching strategy.¹ This programme, together with the school classroom experience which followed, provided the basic framework for the manipulation of the independent variables of this study.

The aspects of microteaching examined in this study may be considered under four headings:

- (a) microteaching programmes
- (b) feedback to the microteaching experience
- (c) transfer of behaviours initially practised in microteaching into the school classroom context, and
- (d) student and staff reactions and attitudes to the practice teaching experiences.

Microteaching Programmes

Three variants of microteaching programmes were introduced during the total research programme:

- (1) the "normal" Stirling programme.

The pattern of microteaching adopted at Stirling was based upon the Stanford model (McIntyre et al., 1972) with the presentation of a particular teaching behaviour being followed by the teach-critique-reteach-critique microteaching cycle.

The manner of presentation of the teaching behaviour coincided with the research trends reported earlier in this chapter.

¹Details of the semester 3 teaching programmes will be presented in Chapter III.

1. A theoretical rationale for a specific teaching behaviour was offered from relevant sections of the psychology of communication or learning.
 2. A written description of the behaviour as a teaching strategy was supported visually by selected videotapes of classroom teaching.
 3. A short teaching sequence occurred with a small class of pupils followed by a feedback session with a videotape replay in the presence of a staff tutor.
 4. The teaching sequence and feedback session were repeated at an interval of 1-2 days after the initial experience.
- (2) a control group which omitted the teaching sequence from their programme, but followed the Stirling pattern in all other respects.
- (3) an Alternative teaching programme based on the recently developed "minicourse" materials (Borg et al., 1970; Gall et al., 1971). By comparison with the "normal" Stirling programme, the majority of unique characteristics of the Alternative programme occurred within the presentation phase. These characteristics were closely linked to research findings in the areas of observational learning theory and reinforcement.
1. Beyond a background statement of rationale in support of the general teaching strategy, very specific statements of objectives were listed for the behaviour being studied.
 2. Practice was given in the identification of the behaviour in general written materials.
 3. Practice was given in creating examples of the behaviour in response to given general stimulus material.

In both these latter stages positive reinforcement of appropriate responses was provided.

4. Perceptual modelling of positive examples of the desired behaviour was offered in cued film sequences of classroom teaching. Scripts of the film sequences were deliberately written to provide frequent examples of the behaviour.
5. Practice was given in the identification of the behaviour in transcripts of classroom lessons.

The usual microteaching cycle was then experienced.

Feedback to the Microteaching Experience

For students including practice teaching in the microteaching context in their teaching programme it was possible to vary the nature of feedback provided in two ways:

1. Technical feedback could be provided in the form either of an audiotape or of a videotape recording of the teaching experience. The reported research was far from conclusive on the relative merits of one or other form of feedback, but probably tended to support the provision of videotape feedback. Some evidence concluded that the provision of videotape or audiotape feedback might be linked to the nature of the behaviours being practised.
2. Inter-personal feedback could be varied by providing or not providing a staff tutor at the feedback phase of the microteaching cycle. Research was certainly inconclusive on this matter. The designers of the minicourse materials have responded to this situation by suggesting that "videotape feedback . . . can be effectively substituted for supervisor feedback" (Borg et al., 1970; p.52).

Transfer of behaviours from microteaching to school classroom

Reviewers of research studies have frequently noted that few studies have attempted to link teacher and pupil performance in the microteaching context with performance of the same behaviours in the school classroom context.

The Stirling Education course included a primary school teaching experience between its semester 3 and 4 programmes. Since participants in each of the three variant teaching programmes proceeded to this stage, the school experience provided an opportunity to measure the performance of treatment groups in this context and to relate it to previous performance and treatment in the microteaching context.

Student and staff reactions and attitudes to the practice teaching experiences

Earlier research at Stirling had indicated a general acceptance of microteaching as a relevant training procedure (Perrott and Duthie, 1970; McIntyre and Duthie, 1972). By including in this research three variants of microteaching programme, two variants of both technical and interpersonal feedback, and an opportunity to practise behaviours in the classroom context, an assessment of participant student and staff reactions and attitudes should not only extend the data previously available but also provide a comprehensive statement of the consumer's view of a range of practice teaching experiences both in the microteaching context and in the school classroom.

SUMMARY STATEMENT OF THE PURPOSES OF THE PRESENT STUDY

The vast majority of published work related to microteaching and microteaching programmes has come from the United States. In Britain, reports of the introduction of microteaching into programmes of teacher education have come from Ulster (McAleese and Unwin, 1971; Brown, 1971), Exeter (Wragg, 1971), Sussex (Britton and Leith, 1971), and Stirling (Perrott and Duthie, 1969). A proliferation of microteaching programmes seemed likely following recent encouragement to teacher educators in the James Report (1972). Highlighting the ever-present difficulty between theory and practice in teaching studies and the questionable contribution of conventional school teaching practice as a solution to this dilemma, the Report suggested:

results at least as satisfactory could be achieved by activities within the college, such as the use of microteaching techniques, work with small groups of children brought into the college for the purpose, and the critical observation of films and videotape recordings (p.25).

In view of this development, and based upon the tentative conclusions and limitations of previous research, the present study was designed:

- (a) to compare student teacher performance in the "normal" Stirling microteaching programme with performance in a programme which omitted the teaching sequence;
- (b) to compare student teacher performance in the "normal" Stirling microteaching programme with performance in an Alternative microteaching programme;

- (c) to evaluate four different forms of feedback as related to both the Stirling and Alternative microteaching programmes;
- (d) to evaluate the extent of transfer of performance from the microteaching context to the school classroom context;
- (e) to gauge the reactions and attitudes of students and staff to the variants of teaching programme, feedback, and practice teaching context.

STATEMENT OF HYPOTHESES TESTED

The following null hypotheses will be tested in this study.

Hypotheses Relating to Teacher Questioning Behaviours and Pupil Response Behaviours

For the Spring Semester, 1972, population:

- H₁ Student teachers who have completed a teaching programme including practice teaching in the microteaching context and have been provided with an audiotape replay of their teaching will perform no differently from student teachers taking the same programme but provided with a videotape replay of their teaching in
- (a) their use of a range of teacher questioning behaviours;
 - (b) the eliciting and nature of pupil responses;
 - (c) follow-up behaviours subsequent to the asking of an initial question or response to such a question.

- H₂ Student teachers who have completed a teaching programme including practice teaching in the microteaching context and have been provided with a staff tutor during the replay of their teaching will perform no differently from student teachers taking the same programme without the provision of a staff tutor in
- (a) their use of a range of teacher questioning behaviours;
 - (b) the eliciting and nature of pupil responses;
 - (c) follow-up behaviours subsequent to the asking of an initial question or response to such a question.
- H₃ No differences in performance will occur between experimental groups due to the interactions between whether or not student teachers are provided with a staff tutor in their practice teaching and whether they are provided with audiotape or videotape feedback in the replay of their practice teaching in the microteaching context, in
- (a) their use of a range of teacher questioning behaviours;
 - (b) the eliciting and nature of pupil responses;
 - (c) follow-up behaviours subsequent to the asking of an initial question or response to such a question.

- H₄ Student teachers who have completed the teaching programme including practice teaching in the microteaching context will perform no differently from student teachers who completed the teaching programme without practice teaching in the microteaching context in
- (a) their use of a range of teacher questioning behaviours;
 - (b) the eliciting and nature of pupil responses;
 - (c) follow-up behaviours subsequent to the asking of an initial question or response to such a question.

For the Autumn Semester 1972 Population:

Hypothesis 1 and hypothesis 2 will be tested for this population.

- H₅ Student teachers who have completed the Stirling programme will perform no differently from student teachers who have completed an Alternative programme in
- (a) their use of a range of teacher questioning behaviours;
 - (b) the eliciting and nature of pupil responses;
 - (c) follow-up behaviours subsequent to the asking of an initial question or response to such a question.

- H₆ No differences in performance will occur between experimental groups due to interactions among the three independent variables (teaching programme, technical feedback or inter-personal feedback) or any two of these variables in
- (a) their use of a range of teacher questioning behaviours;
 - (b) the eliciting and nature of pupil responses;
 - (c) follow-up behaviours subsequent to the asking of an initial question or response to such a question.

For the Spring Semester 1973 population (Primary School Practice):

Hypotheses 1, 2, 3, 4, and 5 will be tested for this student population taking the Spring semester 1973 course.

Hypothesis 6 will be tested for interactions between the teaching programme groups and groups from either of the other two main effects, technical feedback or inter-personal feedback.

The criteria measures used in the testing of these hypotheses will be taken during a lesson taught in a primary school classroom.

- H₇ For student teachers who participated in practice teaching in primary school classrooms, a comparison with their practice teaching in the microteaching context will reveal no differences in
- (a) their use of a range of teacher questioning behaviours;
 - (b) the eliciting and nature of pupil responses;
 - (c) follow-up behaviours subsequent to the asking of an initial question or response to such a question.

Hypotheses Relating to Student Teacher and Staff Tutors' Attitudes
Towards the Teaching Programme

- H₈ Student teachers who have completed a teaching programme including practice teaching in the microteaching context and have been provided with an audiotape replay of their teaching will perform no differently from student teachers taking the same programme but provided with a videotape replay of their teaching in their attitudes towards the teaching programme.
- H₉ Student teachers who have completed a teaching programme including practice teaching in the microteaching context and have been provided with a staff tutor during the replay of their teaching will perform no differently from student teachers taking the same programme without the provision of a staff tutor in their attitudes towards the teaching programme.
- H₁₀ Student teachers who have completed the Stirling programme will perform no differently from student teachers who have completed an Alternative programme in their attitudes towards the teaching programme.
- H₁₁ No differences in performance will occur between experimental groups due to interactions among the three independent variables (teaching programme/technical feedback/inter-personal feedback) or any two of these variables in their attitudes towards the teaching programme.

Hypotheses Relating to Student Teacher Attitudes Towards Their
Practice Teaching Location

H₁₂ Student teachers who have completed a teaching programme including practice teaching in the microteaching context and have been provided with an audiotape replay of their teaching will perform no differently from student teachers taking the same programme but provided with a videotape replay of their teaching in their attitudes towards practice teaching in the microteaching context as compared to primary school classrooms.

H₁₃ Student teachers who have completed a teaching programme including practice teaching in the microteaching context and have been provided with a staff tutor during the replay of their teaching will perform no differently from student teachers taking the same programme without the provision of a staff tutor in their attitudes towards practice teaching in the microteaching context as compared to primary school classrooms.

- H₁₄ Student teachers who have completed the teaching programme including practice teaching in the microteaching context will perform no differently from student teachers who completed the teaching programme without practice teaching in the microteaching context in their attitudes towards practice teaching in the microteaching context as compared to primary school classrooms.
- H₁₅ Student teachers who have completed the Stirling programme will perform no differently from student teachers who have completed an Alternative programme in their attitudes towards practice teaching in the microteaching context as compared to primary school classrooms.

CHAPTER II

DEVELOPMENT AND ASSESSMENT OF THE INSTRUMENTS

This study concentrates primarily on identifying teacher and pupil behaviours in the two practice teaching contexts, microteaching and primary school classrooms.

To this end, consideration is given in this chapter to the nature of a classification system appropriate to the objectives of this study, and a statement is made of the criterion measures to be used. Consistent with these objectives and criterion measures a system is developed for the analysis of a range of teacher and pupil behaviours in lessons taught prior to, and following, the experimental treatment in the microteaching context and during the school teaching experiences.

Beyond this, there is a need to assess whether criteria can be applied within a system of analysis in a reliable way, and in this regard two phases are described:

- (a) a first stage in which four judges independently used the instrument to analyse a sample of practice teaching lessons presented in transcript form;
- (b) a second stage in which a further assessment was made of the reliability of the lesson coding instrument through the lesson data being presented to two judges either in transcript or audiotape form and over an extended period of time.

The final section of the chapter describes the development of instrumentation to gauge the attitudes and reactions to the microteaching context and school practice experience of participant student teachers and staff.

The Lesson Analysis Instrument

CLASSIFICATION OF STUDENT TEACHER QUESTIONING BEHAVIOURS

Teaching materials distributed to student teachers taking the introductory course in education clearly indicate a purpose for the practice teaching sessions.

For the Stirling programme the statement is made:

"Observation of teachers has consistently shown that on average there is a low frequency of questions which are likely to help pupils to do anything more than memorise. It thus appears to be necessary for most teachers to consciously practise asking questions calculated to help pupils to attain other goals as well."

(Notes to Students, Stirling Programme; Appendix C, p.15).

The Alternative programme materials convey the same message in other words:

"The purpose of . . . (the programme) is to help you change your teaching strategies so that you will make greater use of higher cognitive questions. This will help your students develop their ability to think carefully and logically about a subject, in a sustained way."

(Notes to Students, Alternative Programme; Appendix D, p.32).

It seems clear then that the first task in developing an instrument is to describe and categorize teacher questions in terms of the level of cognitive activity which the teacher apparently intends to provoke in the pupils. On this point, neither the Stirling nor the Alternative programme leave any doubts that it wishes student teachers to think about differing question types and purposes in a way which follows the categories described by Bloom and his associates (1956).

Teaching materials distributed to student teachers contain observation instruments for the students to apply to their own practice teaching, and again for both teaching programmes Bloom's categories are used as a base.

The classification system devised by Bloom et al. (1956) categorized educational objectives in terms of a small number of categories necessary to demonstrate the achievement of these objectives. The principles adopted by Bloom in reaching these classifications were listed in priority order as educational, logical, psychological.

A hierarchy was produced of six categories of cognitive educational objectives. This classification is set out in Figure 1.

- 1.00 Knowledge
 - 1.10 Knowledge of specifics
 - 1.20 Knowledge of ways and means of dealing with specifics
 - 1.30 Knowledge of the universals and abstractions in a field

- 2.00 Comprehension
 - 2.10 Translation
 - 2.20 Interpretation
 - 2.30 Extrapolation

- 3.00 Application

- 4.00 Analysis
 - 4.10 Analysis of elements
 - 4.20 Analysis of relationships
 - 4.30 Analysis of organizational principles

- 5.00 Synthesis
 - 5.10 Production of a unique communication
 - 5.20 Production of a plan, or proposed set of operations
 - 5.30 Derivation of a set of abstract relations

- 6.00 Evaluation
 - 6.10 Judgments in terms of internal evidence
 - 6.20 Judgments in terms of external criteria

FIGURE 1

The Taxonomy of Educational Objectives
in the Cognitive Domain

(Adapted from Bloom et al., 1956)

The Stirling programme defines three broad categories of questions (the full details of materials distributed to students can be found in Appendices A-C):

- (a) lower order questions (following Bloom's category of Knowledge):

(these questions) set tasks which do not require pupils to modify, develop or use their existing knowledge or ideas, but merely to recount them. Such tasks include recalling or recognizing previously acquired knowledge, recounting personal experiences, expressing unsubstantiated opinions and giving simple descriptions.

- (b) application/comprehension questions (following Bloom's categories):

tasks which require pupils to use concepts, principles or techniques which they have learned, or partly learned, in contexts which differ to some extent from the contexts in which they have previously been used.

- (c) higher order (analysis/synthesis) questions (following Bloom's categories and including his category Evaluation):

set tasks which require pupils to use "higher order" skills of thinking . . . higher order questions include any which ask pupils to analyze a confused or problematic situation in terms of constituent elements and their relation to one another, or which ask pupils to produce new ideas on the basis of such an analysis.

The Alternative programme employs a taxonomy almost identical to that devised by Bloom et al. (1956). It sets down five main types of questions (see Appendix D):

- (a) knowledge questions, which require the pupil to remember information that has been presented and would include the recall of facts or observations and the recall of definitions;

- (b) comprehension questions, which stress the need for the pupil to organize and select facts and ideas. Generally no information outside the immediate lesson is necessary; a pupil might give a description or state an idea in his own words or compare two ideas;
- (c) application questions, where pupils are given the opportunity to apply their knowledge in solving problems in new situations.
- (d) analysis questions, which encourage pupils to make inferences or find evidence to support concepts or generalizations. Such evidence might be supplied in teaching materials or come from the pupil's own experience;
- (e) synthesis questions, through which the teacher encourages individual expression and thinking. Pupils "put things together in a way that is uniquely their own". The approach taken and the content contained in the pupil response is a matter unique to the individual pupil.

The Alternative programme follows the Stirling pattern in not referring directly to the sixth of Bloom's categories, evaluation. The view held by the staff responsible for the course at Stirling at the time was that, within the microteaching context, there was insufficient time to identify or develop a pupil behaviour profile that would allow for responses to questions emphasizing evaluation abilities as defined by Bloom. In order to conform to the Stirling programme in the breadth of programme offered and to maintain a common time commitment to practice teaching, this element was not offered in the Alternative programme.

In both programmes, reference to this evaluation category was made indirectly through the category labelled "synthesis" questions.

In summary then, it would appear clear from statements of

objectives of the teaching programmes and from the emphases contained in teaching materials provided for student teachers that the basic framework upon which the classification system for teacher questions in this study should be based is the taxonomy assembled by Bloom et al. (1956).

The province of this research study is not to relate or contrast this framework with other theoretical models, nor to assess the theoretical value of Bloom's taxonomy, but to proceed with the definition of an appropriate system of categories of teacher questions which may be tested and then applied to the experimental data collected in practice teaching situations.

CLASSIFICATION OF PUPIL RESPONSE BEHAVIOURS

In seeking to educate student teachers to use questions to develop pupil thinking and to gain evidence of pupil thinking across a range of cognitive levels, assumptions are made that teacher use of the higher cognitive levels will be reflected in pupil responses and thinking skills, and that such pupil behaviour is a very positive objective of education. Research evidence gathered on the former assumption indicates that student teachers educated to use the full range of cognitive levels, and teachers using this range, do gather pupil responses which reflect that range of cognitive activities - (see Davis and Tinsley, 1968; Mood, 1972; Murray and Williams, 1971; Rogers and Davis, 1970; Wilson, 1969). Wood (1970) also subscribes to this view, but cautions educators not to rush to conclusions that teachers' use of higher cognitive categories results in pupils' use of the same categories. Rather, he suggests that the use of higher level categories by pupils is related to, and consistent with, other behaviours of the pupils.

On the issue of the extension of these behaviours into measurable pupil achievement, the research evidence is limited and inconclusive in its findings (Rogers and Davis, 1970; Ragosta et al., 1971). Yet as a result of, or in spite of, these various reports, assumptions are still held by educational theorists and curriculum developers that teachers should place more stress upon the higher level cognitive processes of analysis, synthesis, and evaluation; and that, as a consequence, pupils will benefit and develop desirable patterns of cognitive activity. Both the Stirling and the Alternative programme support this view (Notes to Students, Stirling Programme, Alternative Programme; Appendices A-D).

Further they note that the vital evidence regarding the development of pupil attitudes and thinking is revealed when the pupil responses to teacher questions include examples, or experiences, or reasons to back up the statements.

Pupil responses are often grouped by researchers into two areas, and are usually described as a consequence and covariate of teacher behaviour. Labels such as open/closed (Nuthall and Church, 1971; Barnes et al., 1969), convergent/divergent (Medley et al., 1966; Gallagher and Aschner, 1963; Hudgins and Ahlbrand, 1967), and initiation/response (Flanders, 1970) have been used to define and describe these behaviours.

A common basis for differentiation is evident in all of these situations. On one side of the dichotomy is a pupil response which is predictable, and within limits set by the teacher question; on the other side is a response which is unique and creative, reflecting individual ideas and experience.

The Stirling and Alternative programmes encourage student teachers to regard attention to pupil responses as part of their objectives. Phrases used in the Stirling programme to describe the more limited responses include recall, evidence of comprehension, and description of interests, whilst the second group of responses is described as revealing the way pupils think about the subject under discussion.

Both programmes further develop this emphasis on pupil responses to a second stage by expecting pupils to substantiate their responses through offering reasons, examples, or explanations in association with the response. The Stirling programme describes this as a "justification" of the response (Notes to students, Stirling Programme; Appendix C, p.19) and the Alternative programme as "support" for the criteria expressed in the response (Notes to Students, Alternative Programme; Appendix D, p.55).

CLASSIFICATION OF FOLLOW-UP BEHAVIOURS SUBSEQUENT TO THE ASKING OF AN INITIAL QUESTION OR A RESPONSE TO SUCH A QUESTION

Consistent with the objectives already outlined, the Stirling programme and the Alternative programme include further objectives for student teachers designed to maximize the effect of their use of questions across the full cognitive range.

In the event that a teacher question does not attract a pupil response at all, or a response which the teacher might consider to be inappropriate, follow-up teacher behaviours are described which, for the Stirling programme student ". . . enable him (the pupil) to give a more adequate response".

(Notes to Students, Stirling Programme; Appendix B, p.12), and for the Alternative programme student ". . . require a student (pupil) to develop the quality of his initial response" (Notes to Students, Alternative Programme; Appendix D, p.64).

Both programmes separate these teacher behaviours into two categories. A teacher behaviour which offered a further opportunity to a pupil to respond to a question which at the initial asking had failed to attract a response was described as a "prompt".

On the other hand, a teacher behaviour which invited the pupil to clarify or further develop a first response was regarded as a "probe". (Notes to Students; Stirling Programme, Appendix B, p.12; Alternative Programme, Appendix D, p.64).

CRITERION MEASURES

Previous research fails to agree on a completely appropriate and satisfactory form of defining criterion measures of dependent variables such as the variables used in this study.

(a) In regard to teacher questioning behaviours

Borg et al. (1970), Gall et al. (1970), and Acheson and Tucker (1971) describe a range of measures some of which are reported and related as simple frequencies of occurrence, e.g. frequency of "analysis" questions or frequency of "higher cognitive questions".

Other measures are reported as ratios of sub-group frequencies to the total group frequency;

e.g. percent of higher cognitive questions

$$= \frac{\text{frequency of the sum of } \begin{array}{l} \text{(comprehension)} \\ \text{(application)} \\ \text{(analysis)} \\ \text{(synthesis and)} \\ \text{(evaluation)} \end{array} \text{ questions}}{\text{all questions}} \times 100$$

It is surely unnecessary to argue that there is no particular frequency of questions or group of questions or a known proportion of question types which is desirable in teaching. Yet Borg et al. (1970) and Gall et al. (1970) use these calculations in a way which almost implies that such a teaching strategy is known. Acheson and Tucker (1971) report that one of the stated performance objectives of Minicourse Nine (Gall et al., 1971) is that at least two-thirds of the participants taking the course should increase by at least sixty percent their use of higher cognitive questions in a post-test as compared with the baseline determined in a pre-test. Such a statement places undue emphasis on quantification.

Further, it should be noted that data in the form of an arbitrarily devised ratio does immediately represent a reduction in the presentation of data. A second order of information is offered which may well disguise useful interpretations or considerations of the primary forms of data.

The objectives set down for practice teaching programmes in this study seem to encourage clearly the student teacher to increase his use of certain question types, i.e. to focus upon the frequency of questions asked.

The Stirling programme invites students to practice their use of questions other than lower order categories. The Alternative programme aims for an increase in the use of types of questions

that help develop (pupils') ability to think.

The concern here therefore will be with the determination of any differences between treatment groups in respect to the use of the following categories (or category groups) of questions:

- (i) knowledge/lower order synthesis questions;
- (ii) comprehension/application/analysis/synthesis questions;
- (iii) analysis/synthesis questions (higher order questions);
- (iv) analysis questions;
- (v) synthesis questions.

It would be consistent with the teaching programme objectives if a decrease was registered in the first of these categories, and increases in the remainder.

Reporting of the experimental data in this form necessitates careful interpretation. However, it does present the data accurately and fully, and provides the basis for a clear statement on the achievement of objectives regarding higher order questioning by student teachers.

- (b) The teaching programme objectives for teacher questions are closely linked to expectations regarding pupil responses:

". . . valuable to ask 'open' questions which invite pupils to answer at some length and thus to reveal the way they think about the subject"

". . . questions which attempt to produce pupil thinking at a higher level than recall of specifics"

(Notes to Students, Stirling Programme, Alternative Programme; Appendices A,D.).

Borg et al. (1970) and Shea (1971) have used measures of the length of pupil response as a general indicator of an appropriate response to a higher order question. A brief pupil response was regarded as possible evidence of lack of thought about the question. Acheson and Tucker (1971) made a calculation based upon the frequency responses to higher order questions.

None of these measures seems entirely consistent with the Stirling or Alternative teaching programme objectives. The defined categories of pupil response in the present study reflect the range of responses anticipated from the teacher use of various types of questions, and in particular higher order questions.

Differences between treatment groups will be determined in respect to the categories of pupil response:

- (i) original, i.e. a response containing evidence of independent, often creative thought;
- (ii) supported, i.e. a response accompanied by facts, reasons or examples which explain the criteria or assumptions used in the response;
- (iii) original and supported, and, as well, each of these categories as they follow an analysis or synthesis category teacher question;
- (iv) analysis/synthesis question plus original response;
- (v) analysis/synthesis question plus supported response;
- (vi) analysis/synthesis question plus original and supported response.

Increases in the incidence of these behaviours would be expected, particularly in the latter three categories.

- (c) The teaching programmes emphasize several follow-up behaviours when an initial teacher question fails to produce any response or the anticipated level of response.
- (i) An awareness of the purpose of a question asked of pupils should lead to a decrease in the incidence of pupils being given no opportunity to respond to a question. The asking of higher order questions designed to encourage thoughtful pupil responses should also promote this decline.
- (ii) Similarly, the incidence of pupils not being able to offer a response to the teacher question would be expected to decrease, again particularly when considering teacher higher order questions. Implicit in the objectives set down for the asking of these questions is the intention to provide pupils with problems for which they are able to develop a solution or for which they might engage in "thinking processes" which will lead towards a solution.
- (iii) When the initial question fails to attract a response, the teacher is encouraged to offer further assistance to the pupil in the form of a prompt. It might therefore be expected that the incidence of teacher prompting behaviour would increase, especially following the asking of a question which fails to attract a pupil response.
- (iv) It is an object of the teaching programmes that student teachers follow up their initial questions, should the pupil response fail to reach anticipated levels of originality, clarity, or detail, in the form of a probe.

Teachers practising the use of higher order questions might be expected to increase their use of probing questions in order that pupils examine and further develop their own expressed ideas.

Development of the Instrument

PROCEDURES

After the determination of the categories to be used in the classification of teacher questions, pupil responses and follow-up teacher and pupil behaviours, steps were taken to develop a detailed instrument for use in the analysis of lessons.

(a) Six people participated in the development of the instrument.

This group included:

- (i) two staff members of the Stirling University Department of Education;
- (ii) one research officer of the Stirling University Department of Education;
- (iii) two postgraduate students involved in classroom research;
- (iv) the writer.

(b) The group tasks were to:

- (i) clarify the framework upon which a category system for teacher questions and pupil responses would be based;
- (ii) carefully define each category to be identified in the lesson scripts;
- (iii) develop criteria and examples for identifying each category;
- (iv) develop a detailed set of procedures and documentation for later use by judges in the coding of lesson scripts.

(c) These tasks were achieved over a series of six meetings, each of one to two hours duration.

From the pre-treatment and post-treatment lessons of the Spring semester experiment 1972, five lessons were selected at

random for use at this point in the instrument development. A copy of the following reference materials was available to group members:

- (i) Bloom et al. (1956);
- (ii) Stirling introductory course in education teaching outlines;
- (iii) Alternative programme materials distributed to students;
- (iv) Stirling programme materials distributed to students.

The first meeting was devoted to a discussion of the teaching programme objectives and materials, together with a draft statement of the category system for analyzing teacher questions and pupil responses. Meetings two and three focussed on the coding of lesson sequences in manuscript form. After independent coding, further discussion in pairs and as a whole group produced a clarification and elaboration of the category system.

Meetings four and five followed a similar pattern except that the lesson sequences were on audiotape.

The sixth meeting considered a final draft of the category system incorporating category definitions, examples, and ground rules to be followed by judges in the use of the instruments. Details of the procedures for training judges and checking inter-judge reliability were outlined.

ISSUES

The cognitive processes employed by a teacher prior to asking a question or by a pupil in responding to a question cannot be directly observed. A degree of inference is therefore required in arriving at decisions regarding the teacher response category or the pupil response category when the system of analysis is based upon cognitive processes.

Bloom et al. (1956) refer to this dilemma in introducing the taxonomy and in talking about test questions. Without complete information on the prior experiences and knowledge of each pupil in the microteaching classroom, one cannot with complete confidence know what is involved for them in answering a question. A single teacher question may require quite different levels of cognitive process amongst the several pupils making up the class. A determination of the apparent intention of the teacher in this situation is also difficult. However, this course of action is preferred. Generally the teacher is the major architect of the lesson context, and this context provides the setting in which a judge must infer the intention of the teacher question and the level of cognitive process.

In his review of teacher question classification systems, Gall (1970) cites this problem and suggests that control of the lesson material will create a context in which the intention of the teacher in asking a particular question will be more readily discerned. Such a control was not possible in this study, so this factor must be recognized in assessing the instrument and its reliability.

Bloom et al. (1956) openly admitted that, in developing the taxonomy, the group "had not succeeded in finding a method of classification which would permit complete and sharp distinctions among behaviours" (p.15 and Chapter 3). Bloom differentiates his "knowledge" category from other categories which he describes as "intellectual abilities and skills". The latter are regarded as more complex, higher order behaviours which include, and are built upon, the former simpler, lower order behaviours. Sanders (1966) in applying Bloom's taxonomy to a classification system for questions likens the relationships between categories to colours in a spectrum. It is difficult for any observer to pinpoint exactly the moment when one colour or category of questions passes into another colour or question category. It might be anticipated then that attempting to achieve agreement between several coders would present difficulty.

Similar problems are described by Meux and Smith (1964) as "a gradual shading of one category into another" (p.151). The suggestion is made that it would be convenient if verbal cues could be specified for categories in order that a lower inference level for coders might operate. Although Smith and Meux (1962) later expressed caution about such a course of action, Borg et al. (1970), in the development of minicourse materials, seem to have pursued this line. Borg quotes the work of Groisser (1964) and Loughlin (1961), who attempted to link question stems such as "explain" or "justify" with the seeking of thoughtful response. Gall et al. (1971) in their Summary Chart of Question Types (p.261) emphasize question stems as a guide to classification.

Analysis of lesson scripts in this study found that attention to question stems was unreliable and misleading. Differences in

subject content and context made it impossible to conclude that a certain introductory linguistic form for a question specified the cognitive processes likely to be involved. Bellack et al. (1966) in their work on classroom interaction arrived at a similar conclusion. Whilst admitting to the degree of inference involved, and to the potential problems in achieving reliability between judges, they suggested that questions of validity might arise if a strict and rigid system of formal linguistic analysis was applied to verbal behaviour in classrooms. Such a stand would be taken at the expense of an appreciation of, and sensitivity to, the meanings expressed in the discussion.

Following procedures used by Bellack et al. (1966), questions which served an instructional function were distinguished from questions which were basic to the lesson content development. Instructional questions usually involved procedural matters or performed managerial or disciplinary functions. Rhetorical questions which apparently were not intended to evoke a pupil response were also separated out.

It was to be expected that the practice teaching lessons taught by the student teachers would cover a wide range of school curriculum areas. The initiative for selection of subject material for the lessons was left with the student and, generally, arose out of specialist curriculum studies. In the taxonomy Bloom et al. (1956) make the assumption that the same classes of behaviour may be observed in the usual range of subject-matter content. Several studies in specialist subject content areas have been reported which categorize teacher questions. Clements (1964) classified questions taught by art teachers as they talked with pupils about their artwork. Schreiber (1967) classified social science questions and described

curriculum-specific categories such as "use of globes". Some time was spent by the instrument development group discussing the possible difficulties of curriculum-specific questions. However, it was agreed to extend Bloom's assumption of subject content neutrality to the analysis system developed for this study.

A prime objective in the development of an instrument was that it should be consistent with the objectives and instructions for the two teaching programmes. Both programmes relied heavily on the work of Bloom et al. (1956). However, a small number of modifications was necessary to this classification system and that proposed by Gall et al. (1971).

Even the small sample of scripts studied at this stage revealed a number of questions seeking an opinion from the pupils based solely upon personal preference. Often in this situation the pupil is invited to offer a yes/no response. Such a question is similar to that described by Smith and Meux (1962) and Bellack et al. (1966) as "opining."

With the question "Which painting do you like?" Gall et al. (1971) list an example of such a question under the heading "evaluation type" questions (p.261).

This study follows Claus (1969) in defining a category labelled "lower order synthesis" where, in the words of the ground rules, "the question does not require the pupil to do more than venture an opinion based mainly on personal preference" (Appendix E, p.196). This question category is regarded as comparable to the "knowledge" category, with the teacher demanding from the pupil little cognitive work in responding to the question.

A second modification was generally to scale down the emphasis on the Bloom higher order category (also followed by Gall) of "evaluation". Previous experience in the Stirling programme had found that practice in asking this type of question was unsatisfactory in the microteaching context. For this reason, the Stirling programme printed handouts which referred to a general category of higher order questions as including the Bloom categories of "analysis" and "synthesis" only.

Therefore, in order to maintain a close overlap between the objectives and content of the two teaching programmes, no specific instruction was offered in either programme on the "evaluation" category of Bloom's taxonomy. Any question falling within this category was included within the "synthesis question" category when coded in this study.

The full statement of the instrument including coding rules, examples, and interpretations is included as Appendix E.

An abbreviated statement follows of each of the major question and response categories used in this study.

(a) Teacher questioning behaviours

A question should be regarded and coded as

(i) knowledge when

- . it requires the pupil to remember, either by recognition or recall, ideas, material or phenomena or seeks to establish the pupils' range of experience, generally to establish a framework within which to develop the lesson.

(ii) comprehension when

- . from information given in the lesson, the pupil is asked to organize, make some use of, or to perceive the structure of the material or ideas contained in the information.

(iii) application when

- . on the basis of knowledge which the teacher knows the pupil has already acquired, the pupil is asked to apply this knowledge to a new situation.

(iv) analysis when

- . the pupil is required to break down material into parts, to detect the relationship of the parts and the way they are organized.

(v) synthesis when

- . the pupil is intended to draw upon elements from many sources and to put these together into a structure or pattern not clearly there before or
- . the pupil is asked to adopt a position or stand regarding an issue or makes a judgment.

(vi) lower order synthesis when

- . the question does not require the pupil to do more than venture an opinion based upon personal preference.

(b) Pupil response behaviours

A response should be regarded and coded as

(i) restricted when

- . the pupil responds directly and predictably to a question seeking fairly specific information.

(ii) original when

- . the response contains reasons, facts, examples, or an explanation of the criteria or assumptions upon which the answer is based.

(c) Follow-up behaviours subsequent to the asking of an initial question or a response to such a question

(i) A question should be regarded as a probing question when

- . it seeks clarification or development of an initial pupil response, and
- . it is an extension of a pupil response and arises directly out of a pupil's response.

(ii) A statement should be regarded as a prompt when

- . an opportunity has been given to respond and there has been no response offered to a teacher question, and the teacher again solicits a response by offering some clue to the initial question, often in the form of a restructured question.

Assessment of the Lesson Analysis Instrument

The assessment of the reliability of the system of analysis and its application was carried out in two distinct phases:

(a) phase one

Four judges independently applied the instrument to a sample of twenty practice teaching lessons. The data in this phase was presented in transcript form.

(b) phase two

Two judges independently applied the instrument to three further samples of twenty practice teaching lessons. The presentation of the data to the judges in this phase was deliberately manipulated and was either in transcript form or in the form of an audiotape recording of the lesson.

INTER-JUDGE AGREEMENT

It was appropriate at this stage to determine a formula to reflect the degree of agreement between judges, and to consider the levels of reliability which might be considered acceptable.

In the literature, different formulae have been used to calculate a coefficient representing the degree of agreement between judges. The variety of formulae reflects the different needs of particular research projects but also suggests the arbitrary nature of the measures.

Adams (1964) validated his question classification system with four independent judges. He reported his inter-judge agreement for each question category in the form of a coefficient of concordance. This statistic was based upon a rank ordering compiled from a distribution of frequencies assigned by each judge. The rank order

does obscure the actual frequency counts for the specified variables and as such is not a satisfactory technique for the present study.

Gall et al. (1970) and Acheson and Tucker (1971), involved in studies similar to the present one, quoted reliability coefficients between individual judges or pairs of judges. Although the reports offer no confirming details, the coefficient must be assumed to be a correlation of frequency counts for specified variables, e.g. knowledge questions.

White (1972) used three judges and expressed a degree of agreement as a percentage using the formula.

$$\frac{3 \times \sum abc + (\sum ab + \sum bc + \sum ac)}{\sum a + \sum b + \sum c} \times 100$$

where a, b, and c were the three judges, and

abc was the total number of agreements between a, b, and c

ab sum of agreements between a and b, within category under consideration

ac sum of agreements between a and c, within category under consideration

bc sum of agreements between b and c, within category under consideration

$\sum a + \sum b + \sum c$ $\sum a$ represents the sums of all symbols recorded by the observer indicated, within the category under consideration

The single percentage statistic reported in this way does leave somewhat hidden the agreements between the several pairs of judges and the relationship between these and agreements between all three judges.

Further, the nature of disagreements between judges is not clear when a multiple category system is being used.

Smith and Meux (1962) developed the coefficient R,

$$R = \frac{A_{xy}}{\text{Max } (E_x, E_y)}$$

where

A_{xy} was the number of agreements between judges x and y or teams x and y,
and $\text{Max } (E_x, E_y)$ was the maximum number of questions coded by either of the judges or either of the teams.

This formula might be simply extended to give a statement of agreement between four or three judges and may be regarded as more rigorous than that used by White (1972).

The addition of the multiplier 3 in the numerator of the White formula and the use of the actual identified events for each coder in the denominator is most likely to lead to a lower divisor and therefore a resultant higher coefficient. The denominator of the Smith and Meux formula is based on the assumption that an event identified by any coder is a potential occurrence of the behaviour being studied.

It is important in this research to assess the reliability of the category system across a number of teacher and pupil behaviours. The selection of variables to be used in this way was based upon the stated experimental hypotheses and the reported criterion measures. To this end, twenty-six behaviours were isolated to act as indicators of the degree of agreement between judges using the category system.

These behaviours are listed below:

(a) student teacher questioning behaviours

- (i) total knowledge questions
- (ii) total comprehension questions
- (iii) total application questions
- (iv) total analysis questions
- (v) total synthesis questions
- (vi) total lower order synthesis questions
- (vii) total all kinds questions
- (viii) total comprehension and application probes
- (ix) total analysis and synthesis probes
- (x) total knowledge and lower order synthesis probes
- (xi) total all kinds probes
- (xii) total all kinds prompts
- (xiii) total occasions any questioning behaviours

(b) pupil response behaviours

- (xiv) total restricted responses
- (xv) total original responses
- (xvi) total original plus supported responses
- (xvii) total supported responses
- (xviii) total non-supported responses
- total analysis or synthesis questions followed by . . .
- (xix) restricted responses
- (xx) original responses
- (xxi) original plus supported responses
- (xxii) supported responses

- (xxiii) non-supported responses
- total occasions
- (xxiv) no opportunity to respond
- (xxv) no response
- (xxvi) any response behaviour

The diversity evident in the formulae used to derive coefficients of agreement between judges also extends to the range of reported coefficients and the circumstances under which the assessment of instruments was conducted.

Smith and Meux (1962) in identifying units of classroom discourse used four judges working independently in a first stage, and then grouped in pairs in a second stage. The aim of the second stage was to resolve the differences between each pair of independent judges. The coefficients of agreement calculated on the combined result of each team of judges ranged from .62 to .73.

Bellack et al. (1966) in analyzing class lessons reported percentage agreement between four coders as 84 percent to 96 percent. In arriving at this measure of agreement judges participated in processes of review and arbitration.

A number of studies covered aspects similar to the present study. Claus (1969) reported an 80 percent agreement between judges working on factors affecting teacher higher cognitive questioning skills. In this case judges were required to separate the questions into one of eight categories similar to Bloom's (1956) taxonomy. The agreement figure was represented by the ratio:

$$\frac{\text{total number of agreements}}{\text{total number of opportunities to agree}}$$

Berliner (1969) required three judges to make a distinction between lower and higher order questions; but after completing an analysis of the reliability of the ratings using an analysis of variance procedure, he reported the reliability among these judges as moderate even after ten hours of training. Shea (1971) reported product-moment reliability coefficients between two judges on the occurrence of questioning behaviours as ranging from .72 to .99. Acheson and Tucker (1971) reported a reliability of .81 to .89 amongst three judges using five of Bloom's (1956) categories in Far West Laboratory materials on higher cognitive questions. Reliability achieved with pupil response variables was .80. No description was given of the method of calculation of either of these agreement statistics. Gall et al. (1970) on a field test of Minicourse Nine materials on higher cognitive questions reported fifteen coefficients of a possible twenty as being in excess of .90. The coefficient represents an averaging of the agreements between three pairs of judges, after differences between pairs of judges had been resolved by an "arbitrator". White (1972), with three judges using his lesson sampling instrument for questioning techniques reported percentage agreements of 50 percent to 58 percent at various stages of his instrument assessment. The formula used in this case has already been described.

In all cases the experimental data was presented to the judges in transcript form having been transcribed from audiotape recordings.

Previous research therefore offers no clear guideline in the reporting of agreements between judges assessing the dependability of developed criteria and a system for the analysis of aspects of practice teaching lessons. A wide range of procedures and methods

of calculating and reporting results has been adopted in following through instrument reliability experiments, and an equally wide range of degrees of agreement between judges has been cited.

In this study, within each phase of the reliability experiment, two levels of agreement between judges will be offered. Firstly, a product-moment correlation between pairs of judges will be reported. The calculated coefficient will be based upon the frequency of occurrence of the nominated behaviour in each of the lesson scripts in the full sample coded by the judges.

This step is consistent with much previous research and is considered adequate in establishing the reliability of criterion variables. However, objectives of this study require the identification of a range of behaviours which may occur infrequently. For this reason a second and more rigorous measure is taken of inter-judge agreement, in that data is presented on identified individual events or behaviours. Such a step seems advisable as a test of the conceptual clarity with which categories have been defined, and of the adequacy of their operational definition for use in subsequent research work.

The coefficient reported as a measure of agreement between judges on individual events was based upon the ratio developed by Smith and Meux (1962), except that more stringent tests of inter-judge agreement will be reported. Agreements between four judges and three judges will be documented as well as agreement between pairs of judges.

The basic formula used to calculate the coefficient of agreement, R, was

e.g. between three judges

$$R = \frac{A_{xyz}}{\text{Max } (E_x, E_y, E_z)}$$

where

A_{xyz} was the number of agreements between judges

x, y, and z; and

Max (E_x, E_y, E_z) was the maximum number of

occurrences of the particular behaviour coded by

any of the judges, or any group of judges.

DETAILS OF ORGANIZATION - PHASE ONE

Using the instrument developed to identify teacher questioning and pupil response behaviours, four judges were trained in the use of the instrument and then set the task of coding a sample of twenty lessons.

Two of the four judges had participated in the development of the instrument and associated rules, the other two judges had not. Training took place over a number of sessions in which discussion centred around the theoretical basis of the total study and the instrumentation. The definitions of teacher and pupil behaviours and examples of these behaviours were related to transcribed lesson materials. Difficulties were shared and resolved. When all judges seemed confident concerning the framework and operation of the instrument, they proceeded independently to code the experimental transcripts.

The sample of twenty lessons used for this phase of the reliability assessment was chosen randomly from the

pre-treatment and post-treatment lessons recorded during the Spring semester 1972 experimental programme. The audiotape recordings of these lessons were transcribed according to the details set down in the instrument (see Appendix E). No lesson was identified to the judges as a pre-treatment or post-treatment lesson, nor was it in any way identified with a particular treatment group. The ordering of the twenty lessons presented to the judges was random.

The coding phase occurred over a two-week period. Twice during this time all four judges marked a common additional lesson script. In this way the researcher maintained a check that no major misinterpretation of the instrument was evident.

RESULTS - PHASE ONE

Agreement between Four Judges Based upon Correlations Calculated on Frequency of Occurrence of Nominated Behaviours

The coefficients of inter-judge agreement over twenty lesson scripts on nominated behaviours are summarized below in Tables 1, 2, and 3.

Table 1 represents the data for student teacher questioning behaviours. Part (1) of the table lists

- (a) the median mean frequency of occurrence, and
- (b) the range of frequency of occurrence of each behaviour as identified by the four judges.

For each behaviour, an analysis of variance was performed on the frequency counts of the four judges. In no case was the F-ratio significant at the 5 percent level. Therefore, it may be assumed that there is no real difference between judges in their identification of these behaviours.

It is possible to organize the data of the four judges (1, 2, 3, and 4) in six pairings (1/2, 1/3, 1/4, 2/3, 2/4, and 3/4). Part (2) of the table lists the product-moment correlation coefficients for the four judges when grouped in this way. Column (a) lists the median coefficient for the six pairs of judges, and column (b) the range of coefficients across the six pairs of judges.

The calculation of a product-moment correlation coefficient was rejected as a reasonable indicator of a degree of agreement between judges when, over the four judges, the average number of non-zero frequencies of occurrence of the behaviour was less than 50 percent, i.e. ten of the twenty scripts.

When the frequency of occurrence of a behaviour dropped below this criterion and, as a consequence, the calculation of a product-moment coefficient was rejected, the data was reduced into two categories. Over the twenty lesson scripts the two categories formed were

- (a) the number of scripts having a zero frequency of occurrence of the behaviour under consideration, and
- (b) the number of scripts having a non-zero frequency of occurrence.

In these circumstances, calculation of a tetrachoric r would give a coefficient numerically equivalent to a Pearson r , and may be regarded as an approximation to it. However, observation of the reduced data gives rise to doubts about the use of the tetrachoric coefficient. In several instances the split of data is very one-sided, and a setting out of the data in a four-fold contingency table reveals zero entries in individual cells. The calculation of the tetrachoric correlation was rejected on these grounds.

As Light (1973) demonstrates, chi-square and the phi coefficient are inappropriate for the same reason of one-sidedness. Cohen (1960) developed a measure of agreement to cope with this. When related to the layout of data in the form of a contingency table, Cohen proposed a statistic, K, which compares the observed entries on the main diagonal with the expected entries on this diagonal. His approach avoids the problem of being affected by departures of observed from expected cell frequencies in the off-diagonal cells.

The statistic K is denoted as follows:

$$K = \frac{P_o - P_e}{1 - P_e}$$

$$\text{where } P_o = \frac{1}{n} \sum_{i=1}^c n_{ii}$$

$$\text{and } P_e = \frac{1}{n} \sum_{i=1}^c n_{i+} n_{+i}$$

which compares the observed entries for the main diagonal with the expected entries on this diagonal.

Table 1

Student Teacher Questioning Behaviours

Inter-judge Agreement

	(1)		(2)	
	(a) Four independent judges Mean frequency per script Median	(b) Range	(a) Six pairs of judges product-moment correlation coefficient Median	(b) Range
Total knowledge questions (K)	17.38	15.80-17.70	.93	.87-.95
Total comprehension questions (C)	4.78	4.04- 6.55	.73'	.62-.87
Total application questions (AP)	* not calculated			
Total analysis questions (AN)	2.80	2.65-2.90	.84	.77-.90
Total synthesis questions (S)	1.60	1.20-2.25	***(.70)	
Total lower order synthesis questions (LOS)	7.20	7.00-7.70	.90	.81-.95
Total all K, C, AP, AN, S, LOS questions	34.05	33.55-34.50	.97	.94-.99
Total comprehension) application) probes	0.68	0.60- 1.05	** not calculated	
analysis) synthesis) probes	2.45	1.30-2.70	.90	.88-.95
knowledge) lower order) probes synthesis	0.78	0.45-1.70	***(.65)	
Total all kinds probes	4.00	2.45-5.20	.94	.91-.96
Total all kinds prompts	1.68	1.55-1.85	.62	.48-.83
Total occasions any questioning variables (n ≈ 800)	40.0	37.55-40.40	.98	.97-.99

* Calculation rejected, by observation. For eighteen of the sample of twenty scripts, three or more judges were agreed on a zero frequency of occurrence of the behaviour. A non-zero frequency of occurrence was agreed by at least three judges on one further script.

** Calculation rejected, by observation. For sixteen of the sample of twenty scripts, three or more judges were agreed on a zero frequency of occurrence of the behaviour. A non-zero frequency of occurrence was agreed by at least three judges on a further three scripts.

*** For this variable, the figures reported are values not of the product-moment correlation coefficients but of the K coefficient.

Table 2 follows exactly the same pattern for the pupil response behaviours.

Table 2

Pupil Response Behaviours Inter-judge Agreement

	(1)		(2)	
	Four independent judges mean frequency per script		Six pairs of judges product-moment correlation coefficient	
	Median	Range	Median	Range
Total restricted responses	34.53	32.60-36.90	.97	.95-.99
Total original responses	6.28	4.15-8.90	.84	.59-.93
Total original plus supported responses	2.70	2.45-5.55	.66	.53-.96
Total supported responses	8.55	6.85-13.05	.95	.94-.99
Total non-supported responses	32.00	27.45-34.70	.97	.95-.99
Total analysis or synthesis questions followed by				
restricted responses	4.18	4.15-5.00	.91	.86-.95
original responses	2.53	1.45-4.15	.69	.62-.87
original plus supported responses	1.50	1.25-3.15	.56	.53-.94
supported responses	4.70	4.05-5.00	.87	.78-.99
non-supported responses	3.40	1.50-3.65	.81	.60-.90
Total occasions				
no opportunity to respond	5.83	2.85-6.20	.85	.68-.95
no response	6.70	6.15-7.20	.96	.93-.97
Total occasions any response variables (n ≈ 1150)	57.50	55.70-58.50	.98	.94-.99

For the questioning behaviours, over the six pairs of judges, the range of product-moment correlation coefficients is .48 to .99, with a range of median coefficients from .62 to .98. In both cases the lower limit of these ranges describes the reliability of the judges in identifying teacher prompting behaviour. It should be noted that the mean frequency of occurrence of this behaviour as coded by all four judges was well under two occasions per script.

It would appear that the judges experienced difficulty in isolating prompting behaviour from the main stem of a teacher question. In part this may have been associated with the arbitrary time'pause of one second suggested in the rules as sufficient opportunity for a pupil response to be made to a teacher question.

Should the teacher questioning behaviours identified in this sample of scripts be an accurate sample of the full set of criterion measures, then it would appear that the student teachers very rarely engage in the behaviour "asking of application questions". Over the twenty scripts, only eleven such questions were identified by any judge, and these were contained in two scripts. Such a situation has previously been noted by Gall et al. (1970) and Acheson and Tucker (1971) and may well signal a warning regarding the definition of this behaviour, or may result from some factor connected with the microteaching context.

For the pupil response behaviours, the range of correlation coefficients is .53 to .99 over the six pairs of judges. The range of median coefficients is .56 to .98. The lower limit in each case is attributable to the pupil behaviour "original plus supported" response. The frequency of occurrence of this behaviour for all four judges was less than three occasions per script and was the least frequently identified response behaviour.

It was possible to present product-moment correlations across twenty-two teacher and pupil behaviours. Over six pairs of judges, one hundred and thirty-two correlations were calculated. Only twenty-two of these were less than .75 - eight questioning behaviours and fourteen response behaviours. Of these, sixteen correlations resulted from behaviours with a median mean frequency of occurrence of less than three occasions per script.

Judges 2 and 3 were members of the group which assisted with the development of the instrument. As might be expected, this pair of judges obtained the highest level of consistency of all the six pairs of judges, with a median correlation across all behaviours of .95 and all correlations in excess of .80. A further three pairs of judges achieved a median correlation across all behaviours in excess of .90, and the remaining two pairs obtained a median correlation of .83.

Agreement between Four Judges Based upon the Identification of Individual Events

Using a modification of the formula developed by Smith and Meux (1962), agreements on individual events identified by the four judges are presented below in Table 3. The maximum total number of individual events identified by a single judge was 2469 over the sample of twenty scripts.

Table 3

Inter-judge Agreement on Individual Events

Agreement	Percentage agreement over all events	Percentage agreement range over 20 sessions
Agreement among 4 judges	48.0	33.8-68.8
Agreement among at least 3 judges	80.5	69.7-100.0
Agreement between judge pairs		
1 and 2	66.8	56.3-87.5
1 and 3	64.7	50.0-83.3
1 and 4	64.6	45.9-87.5
2 and 3	79.8	62.5-100.0
2 and 4	70.7	53.1-90.9
3 and 4	70.2	49.0-90.9

The trends evident in the correlational analysis are maintained in this more rigorous measure of agreement.

Agreement among at least three judges in any one of the twenty scripts is never less than 69 per cent and over all events in all twenty scripts exceeds 80 per cent.

Judges 2 and 3 demonstrate a 79.8 percent agreement on individual events, with the range of agreements across the six pairs of judges being 64.6 percent to 79.8 percent.

In conclusion, the results of this phase of the assessment of the lesson analysis instrument appear quite consistent with, and within the limits of, evidence quoted from previous studies. The results confirm the adequacy of the definition of categories within the instrument and allow confidence that the instrument might be usable by teacher educators, students, and researchers in describing certain classroom events.

DETAILS OF ORGANIZATION - PHASE TWO

The several studies quoted earlier in this chapter presented classroom data for analysis to judges in transcript form. For reasons of economy of time and money, such a course of action was not possible in this study. The data upon which the experimental hypotheses will be tested consists of approximately 450 pre-treatment, post-treatment, and school experience lessons. Two judges, judges 2 and 3 of the phase one study, coded all the data presented to them in cassette audiotape form.

Phase two of the assessment of the instrument seeks to establish whether the measures of agreement between these two judges vary according to the form of presentation of the data. Building upon the data obtained in phase one for judges 2 and 3, this further verification of the instrument occurred in three stages (a), (b) and (c):

- (a) a second sample of twenty lessons, selected in the same manner as the initial sample, was coded by the two judges. The first sample of twenty lessons was designated group 1 and this second sample group 2. The group 2 sample of lessons was presented to the judges on cassette audiotape, and the same two levels of inter-judge agreement measures calculated, i.e.
 - (i) a product-moment correlation between the two judges based upon the frequency of occurrence of nominated behaviours in each of the lesson scripts;
 - (ii) a coefficient, following Smith and Meux (1962), based upon agreement between the two judges on individual events.

Data derived from the analysis of these lesson audiotapes permitted observations to be made about group 2 inter-judge agreement, and enabled a comparison to be made with the performance of the same pair of judges coding group 1 materials, in transcript form.

- (b) a third sample of twenty lessons selected in the same matter as the initial sample was coded by the two judges. This sample, designated group 3, was presented to judge 2 on cassette audiotape, and to judge 3 in transcript form.

Measures of agreement between the two judges were derived from this coding of the same group of lessons presented in a different form to each judge.

- (c) the initial sample of twenty lessons, group 1, was presented to the two judges on cassette audiotape.

From this stage, the following sorts of evidence were available:

- (i) a further set of measures of agreement between two judges using the instrument on a sample of lessons presented in audiotape form,
- (ii) a comparison of these measures of agreement with those obtained for the same sample of lessons previously presented in transcript form,
- (iii) for each of the two judges, evidence on their ability to sustain the same patterns over the period of three months which elapsed between the phase one coding and this final stage of phase two coding;

RESULTS - PHASE TWO

Tables 4 to 9 summarize the data derived from phase two of the assessment of the instrument.

Table 4 contains four sets of correlational measures of agreement between judges 2 and 3 for the questioning behaviours.

The first set of measures represents the results of the phase one coding and the other three sets represent the three stages (a), (b), and (c) of phase two.

Table 5 contains information as for Table 4 for the pupil response behaviours.

Table 4

Student Teacher Questioning Behaviours
Inter-judge Agreement - Phase Two

Phase one results
Stage (a) Stage (b) Stage (c)

Format	Phase one results		Stage (a)		Stage (b)		Stage (c)	
	Transcript	Audiotape	Judge 2 audio-cassette	Judge 3 transcript	Audiocassette	Group 1	Group 2	Group 3
Data sample	Group 1	Group 2	Group 3	Group 3	Group 1	Group 1	Group 2	Group 3
Correlations, average frequency of occurrence per session over 20 sessions for listed categories								
Questioning behaviours	r 23	average frequency	r 23	average frequency	r 23	average frequency	r 23	average frequency
Total knowledge questions (K)	.95	17.42	.98	23.70	.99	20.8	.98	17.0
Total comprehension questions (C)	.87	4.78	.98	9.55	.97	8.75	.98	6.25
Total application questions (AP)	*	0.10	*	0.13	*	0.13	*	0.10
Total analysis questions (AN)	.81	2.78	***(.80)	1.35	.76	2.65	.79	2.55
Total synthesis questions (S)	***(.79)	1.60	***(.80)	1.18	***(.80)	2.03	***(.80)	1.65
Total lower order synthesis questions (LOS)	.95	7.35	.99	6.00	.99	8.83	.94	6.55
Total all K, C, AP, AN, S, LOS questions	.99	34.02	.99	42.85	.94	43.15	.99	34.15
Total comprehension) probes	*	0.65	*	0.45	***(.89)	1.20	*	0.75
application) probes	.88	2.47	***(.82)	0.98	.92	1.95	.95	1.98
analysis) probes	***(.52)	1.40	***(.79)	0.58	***(.89)	0.68	***(.89)	0.53
synthesis) probes	.93	4.55	.97	2.05	.97	3.4	.97	3.3
knowledge) probes	.83	1.68	.91	2.0	.96	4.3	.96	2.25
lower order) probes	.99	40.28	.98	46.75	.99	50.95	.99	39.55
synthesis)								
Total all probes								
Total all prompts								
Total any questioning variables								

* see footnote Table 1, p.81

*** see footnote Table 1 and text pp.79,80.

Table 5
Pupil Response Behaviours Inter-judge Agreement-
Phase Two

Format	Phase one results		Stage (a)		Stage (b)		Stage (c)	
	Transcript	Audiotape	Judge 2 audiotape Judge 3 transcript	Audiocassette	Group 1	Group 2	Group 3	Group 1
Data sample	Group 1	Group 2	Group 3	Group 1	Group 2	Group 3	Group 1	Group 1
Correlations, average frequency of occurrence per session over 20 sessions for listed categories								
Response behaviours	r ₂₃	average frequency	r ₂₃	average frequency	r ₂₃	average frequency	r ₂₃	average frequency
Total restricted responses	.99	34.53	.98	47.00	.99	44.45	1.00	36.93
Total original responses	.93	6.28	.89	3.45	.98	6.60	.95	5.35
Total original plus supported responses	.96	2.70	*** (.90)	1.65	.98	3.55	.92	2.30
Total supported responses	.99	7.35	.96	3.90	.99	10.50	.98	8.23
Total non-supported responses	.99	33.33	.98	46.00	.99	39.00	.99	33.73
Total analysis or synthesis questions followed by restricted response	.95	4.28	.60	1.23	.94	4.30	.97	4.10
original response	.87	2.53	*** (.89)	1.03	.99	3.10	.95	1.90
original plus supported response	.94	1.50	*** (.77)	0.58	.98	2.10	.83	1.10
supported response	.99	4.40	.97	1.33	.98	4.40	.99	4.35
non-supported response	.90	2.40	*** (.89)	0.80	.95	3.00	*** (.90)	1.63
Total occasions								
no opportunity to respond	.95	6.15	.87	2.10	.96	6.15	.97	4.25
no response	.97	6.75	.94	7.35	1.00	9.35	.97	7.10
Total response variables	.99	58.08	.97	63.90	.99	69.98	.99	56.45

* see footnote Table 1, p.81

*** see footnote Table 1 and text pp.79, 80.

Table 6 lists the measures of agreement between the two judges on all individual events over each group of twenty lessons.

Table 6
Inter-judge Agreement on Individual
Events - Phase Two

Agreement	Phase one results		Phase two		
	Transcript Group 1	Audiotape Group 2	Judge 2 audiotape Judge 3 transcript	Audiotape Group 1	Stage (c)
Format/Data Sample					
Number of identified events by either coder	approx. 2469	2435	2742	2215	
Overall agreement on individual events over 20 sessions (%)	79.8	84.2	88.9	81.9	
Range of agreement on individual events over 20 sessions (%)	62.5 - 100.0	72.6 - 93.4	76.7 - 97.4	55.0 - 93.7	

Table 7 lists the mean score in minutes taken to code a single lesson either in transcript or in audiotape form.

Table 7

Time Taken to Code Lessons - Phase Two

Format Data sample	Phase one results		Phase two	
	Transcript group 1	Audiotape group 2	Judge 2 audiotape Judge 3 transcript group 3	Audiotape group 1
Time (minutes) taken by two judges to code one session	43.35	54.00	49.40	39.95
	39.60	49.30	34.50	38.00

For each of the judges 2 and 3 Table 8 contains the correlational measures of agreement of their coding of group 1 lessons presented initially in transcript form and three months later on cassette audiotape.

The measures are listed for teacher questioning behaviours and pupil response behaviours.

Table 9 is derived from the same data as Table 8 but contains measures of agreement on individual events within the twenty lessons.

Table 8
Stability of Coding Behaviour

	Correlations ^r 23 transcript - audiotape Group 1	
	Judge 2	Judge 3
<u>Questioning behaviours</u>		
Total knowledge questions	.95	.95
Total comprehension questions	.94	.91
Total application questions	*	*
Total analysis questions	.94	.77
Total synthesis questions	*** (.90)	*** (.89)
Total lower order synthesis	.94	.94
Total all K,C,AP,AN,S,LOS questions	.99	.99
Total comprehension) application) probes	*	*
analysis) synthesis) probes	.90	.94
knowledge) lower order) probes synthesis)	*** (.44)	*** (.48)
Total all probes	.95	.77
Total all prompts	.83	.83
Total all questioning variables (n ≈ 800)	.99	.98

Table 8 (continued)

	Correlations r_{23} transcript - audiotape Group 1	
	Judge 2	Judge 3
<u>Response behaviours</u>		
Total restricted responses	.68	.74
Total original responses	.97	.93
Total original plus supported responses	.97	.78
Total supported responses	.99	.97
Total non-supported responses	.94	.96
Total (analysis restricted responses (synthesis	.99	.95
Total (analysis original responses (synthesis	.94	.75
Total (analysis original plus supported responses (synthesis	.91	.70
Total (analysis supported responses (synthesis	.98	.97
Total (analysis non-supported responses (synthesis	.98	.70
Total all response behaviours	.93	.86

* see footnote Table 1, p.81

*** see footnote Table 1 and text pp.79 - 80.

Table 9

Stability of Coding Behaviour by Individual Events

Comparison transcript/ audiotape format Group 1 data sample	Judge 2	Judge 3
Agreement		
Number of identified events in either format	2261	2347
Overall agreement on individual events over 20 sessions (%)	79.3	67.5
Range of agreement on individual events over 20 sessions (%)	61.1 - 100.0	54.3 - 86.5

An overall review of these results suggests a clear further confirmation of the already established satisfactory levels of agreement between independent judges when using the lesson analysis instrument.

Taking the results in the stages already outlined for phase two,

(a)

(i) a high degree of agreement was achieved by the two judges in the identification of teacher questioning and pupil response behaviours. For the sixteen behaviours where a product-moment correlation was calculated the coefficient ranged from .60 to .99 with only three behaviours achieving a coefficient of less than .90.

(ii) The percent agreement on individual events over the twenty lessons was 84.2 per cent.

(iii) No pattern of difference is evident between these results and those obtained by the two judges in coding lessons presented in transcript form.

(b)

(i) a correlation coefficient was calculated for twenty-two teacher and pupil behaviours. Agreements ranged from .76 to 1.00 with only one behaviour achieving a coefficient less than .90.

(ii) The percent agreement on individual events was 88.9 percent.

(c)

(i) The measure of agreement obtained from the coding of this sample (group 1) of twenty lessons presented in cassette audiotape form compares closely with the measures obtained from the group 2 lessons also presented in audiotape form.

(ii) No consistent pattern of difference can be discerned when

comparing the measures derived from the coding of audio-tapes with those from the coding of transcripts.

- (iii) Over the twenty lessons, an additional 254 individual events were identified by the judges when working from transcripts. Such a difference (an average of twelve events per lesson) may reflect the background and experience in the Scottish usage of the person transcribing the audiotape materials. Both judges were visitors to Scotland and may be less adept at deciphering and separating pupil responses, particularly bearing in mind the technical difficulties of audio-recording in classroom situations.
- (iv) Dependent upon the resources available to a researcher it may be important to search for a difference in time taken to code lessons in transcript or audiotape form.

Although the transcript lessons represented a clear time economy of approximately fifteen minutes per lesson for the group 3 lessons, this trend was not sustained for the group 1 lessons where the time spent coding transcript and audiotape lessons was approximately the same.

Consideration of the time taken to code lessons across phase one and all three stages of phase two of the reliability study (see Table S) suggests that a general learning of the coding skills may have occurred. Such an interpretation certainly appears likely with the coding from audiotape in stages (a) and (c).

No clear pattern of difference was evident between the two judges on the criterion of time spent in coding lessons.

- (v) For judge 2, over twenty-two behaviours, the range of correlations between codings made from transcripts and codings from audiotape was .68 to .99. The percent agreement overall

on identified individual events was 79.3 percent over the twenty lessons with a range from 61.1 percent to 100.00 percent. Judge 3 recorded a correlational range of .74 to .99. Percent agreement overall on individual events was 67.5 percent ranging from 54.3 percent to 86.5 percent.

Phase two of the instrument assessment confirms the results of phase one in that independent judges were able to use the instrument to identify teacher and pupil behaviours in lesson sequences. The recorded measures of agreement justify a high degree of confidence that the instrument may be proceeded with in the major experimental study.

A consistent pattern of satisfactory inter-judge agreements was obtained with the presentation of data in the alternative audiotape form and similarly a high level of stability of coding was demonstrated by both judges over the extended period of time of three months.

Taking together the results of phase one and phase two of the assessment of the lesson analysis instrument, it can be concluded that reliable procedures have been established for each of the criterion measures formulated earlier in this chapter.

Development of Instruments to Measure
Attitudes and Reactions to Practice Teaching in
the Microteaching Context and in the Primary
School Classroom

THE MICROTEACHING CONTEXT

With the introduction of the Alternative programme and the manipulation of factors of the microteaching format, particularly in the form of feedback from microteaching lessons, student teacher and participating staff tutor comments seemed essential on these changes and variations.

Although there is little clear evidence, for student teachers it is entirely probable that acceptance of training methods has an indirect influence on performance (Stones and Morris, 1972). Certainly for staff, as initiators and decision-makers in curriculum, their views must contribute to an assessment of the teaching programmes and to the subsequent development of the introductory education course.

Two questionnaires were therefore developed around a common core of questions. One questionnaire was administered to all students taking the Autumn semester 1972 programmes, and a second questionnaire was given to staff members participating as tutors during the microteaching programme.

Both questionnaires are included in the Appendices, p.224; p.238.

The development of the questionnaires was almost solely the responsibility of the researcher. With the experimental population being the total student population and most staff being engaged in the programme, trialling of a penultimate form of either questionnaire was not possible without risking contamination of the eventual responses. Checks were built into the instrument to assess the

reliability of the responses. Non-involved staff members were invited to comment on a final form of the questionnaire from the point of view of general presentation and question clarity.

A mixture of structured questions, some multiple choice, together with open-ended questions was used. Where a student or a staff tutor was invited to make a response along a continuum, a statement was invited of the personal criteria employed in arriving at the particular response.

The questionnaire designed for student teachers contained two major sections:

- (a) questions concerning statements of behaviours studied in the teaching programme. In the main, the statements followed ideas expressed in the printed materials distributed to students during the teaching programme. For each of these questions, the student teacher was invited to make a response regarding
 - (i) his attitude towards the behaviour in terms of his own practice teaching experiences,
 - (ii) the degree to which the teaching programme facilitated the planning, practice, and achievement of the stated behaviours, and
 - (iii) his perception of his own improvement in practising the behaviour.
- (b) questions concerning aspects of the teaching programme which contribute to the practice teaching lessons in the microteaching context,
 - (i) printed materials distributed to students ;
 - (ii) film/videotape examples of specified behaviours ;
 - (iii) planning for microteaching lessons ;
 - (iv) replay sessions.

The questionnaire submitted to staff tutors followed closely the second section of the student questionnaire, although additional responses were invited which recognized their role as tutors and as the group responsible for decisions on course development.

Frequently staff were invited to respond to questions from their own viewpoint and also from their perceptions of the student teacher viewpoint.

THE PRIMARY SCHOOL CLASSROOM CONTEXT

Student teachers who had taken part in practice teaching sessions in the microteaching context during both the Spring and Autumn semesters of 1972 subsequently participated in a practice teaching experience in a primary school classroom in the Autumn semester of 1973.

An opportunity was therefore available to gather reactions from student teachers on the potential of practice teaching in this different context.

A single open-ended question was devised which invited comment on the ways in which the classroom experience extended or limited the teacher's ability to practise behaviours previously practised in the microteaching context.

Summary

Following the statement in Chapter 1 of experimental hypotheses concerning teacher and pupil behaviours, criterion measures have been stated as a preliminary to the development of an instrument to identify these behaviours in the microteaching and school classroom contexts. The reliability of this instrument when used by independent judges for coding lesson sequences has been demonstrated by two measures of agreement, one correlational in nature, the other of agreement on individual events. Reliability has also been demonstrated for data presented in either transcript or audiotape form.

Questionnaires have been designed to assess the attitudes of student and staff participants to a variety of elements of the experimental situation.

CHAPTER III

EXPERIMENTAL DESIGN AND ORGANIZATION

The object of this chapter is to describe the development of an experimental design which permitted the operation and measurement of the selected variables and through which the hypotheses could be tested. Details will be presented regarding the experimental population; factorial design; the course lecture, seminar, and practice teaching programmes; semester organization; and experimental treatments.

As outlined in Chapter I, teacher questions, accompanying pupil and teacher behaviours, and student teacher and participant staff members' attitudes provide the dependent variables of the study. The construction and validation of instruments to measure these behaviours have been described in Chapter II.

The independent variables relate to the practice teaching element of the introductory course in education at Stirling. The major focus is upon the microteaching programme, but there is a follow-up in a regular primary school classroom.

The manipulation of these variables within an ongoing tertiary course of teacher education imposes limitations upon the research which would not be encountered in a laboratory situation. Some difficulties are experienced, and indeed have to be tolerated, arising out of an inability to control certain factors within the design.

A contribution to the variance in measured performance would certainly result from factors outside the research design such as:

- (a) the entry profile of the student teachers - their academic background, IQ, personality, and, in this introductory course in education, their attitude to education and teaching;

- (b) the prior knowledge and responsiveness of pupils attributable to their backgrounds and personality differences;
- (c) the selection of subject content for the practice teaching lessons;
- (d) the different styles of supervision employed by staff members during the review phase following microteaching lessons.

In order to offset the lack of tight control over these factors, and as far as possible to maintain a valid interpretation of results, the design proposed relies heavily on a randomization of subjects to treatment groups and experimental situations.

Measures of performance in the dependent variables were obtained from a pre-treatment lesson and a post-treatment lesson. Campbell and Stanley (1963) warn of the potential contribution of pre-treatment scores to post-treatment variance. This factor is unchecked in this study.

A pre-treatment measure has frequently been used in research similar to the present study, e.g., Borg et al. (1970), Gall et al. (1970), Hilliard (1970), Acheson and Tucker (1971), Shea (1971). In each of these situations a specific treatment has been central to the study, and pre- and post-treatment measures are taken in order to assess gains made by subjects which may be attributed to the treatment. In these circumstances an analysis of covariance is applied to the experimental data, with the pre-treatment scores serving as the covariate and residual gain scores as the dependent variable.

In so far as there are consistent individual differences across pre-test and post-test, this procedure allows for the extraction of

variance accountable in terms of these differences, and thus makes it possible to identify the effects of the independent variables. On the other hand, when correlations between pre-test and post-test measures are small, nothing is gained by this procedure; and, since the use of simple gain scores in these circumstances merely increases the size of random "error" variance, no use can be made of pre-test scores in the statistical analysis of results.

The decision to take pre-test measures was thus based largely on the plausible hypothesis that these would be significantly correlated with post-test measures. Whether or not scores from this measure are used in an analysis of covariance will be determined following a correlational analysis between pre- and post-treatment measures of a large range of teacher and pupil behaviours. In any event, it is considered reasonable to interpret, in part, the post-treatment scores in criterion measures in terms of the pre-treatment scores.

Further, the pre-treatment measure does provide a baseline for consideration of the gains made by the control treatment group in Stage 1. This group participated in the lecture and seminar programme of the course but not in the practice teaching phase.

Outside the sphere of interpretation of experimental results, the pre-treatment measure provided entry behaviour data on the student teachers, which may be reviewed against the findings of studies such as Floyd (1960) and Adams (1964), that teachers place a heavy emphasis on factual recall and other lower cognitive tasks in their questioning behaviour.

Overall then, whilst recognizing the complicating and unchecked presence of a possible pre-treatment practice effect adding to the measures taken post-treatment, yet the pre-treatment measure seems well justified.

Design Outline

There were three stages in the experimental programme. Each stage corresponded to a teaching semester of the university.

Stage 1, Spring semester 1972

One treatment group took the full Stirling programme, whilst a second group acted as a control group and did not participate in the practice teaching lessons in the microteaching context.

Feedback variables were manipulated in the microteaching context. Criterion behaviours were measured in a pre-treatment lesson taken at the commencement of the semester and in a post-treatment lesson taken at the conclusion of the experimental programme. Both these measures were gathered in the form of an audiotape recording of the lesson.

Stage 2, Autumn semester 1972

The total population was divided into two groups: one taking the full Stirling programme, the other group taking an Alternative programme. In both cases, feedback variables were manipulated within the microteaching context.

- (i) Criterion measures were taken in the same manner as for the Stage 1 programme.
- (ii) Two questionnaires were administered to obtain from student teachers and staff tutors their reactions to the different teaching programmes and to the various treatments.

Stage 3, Spring semester 1973

Students from both the Spring and Autumn semesters 1972 who were continuing their studies in education participated in a practice teaching experience in primary school classrooms.

- (i) Criterion behaviours were measured using an audiotape recording taken of a segment of a lesson taught during this period.
- (ii) A questionnaire was administered inviting students to compare and contrast their practice teaching experiences in the microteaching context and in the primary school classroom.

Stage 1, Spring Semester 1972

EXPERIMENTAL SAMPLE

One hundred and forty-two students enrolled for the introductory education course (Education 13). This sample population included students beginning a major study in the area of Education. For these students the course would include the study of one or more specialist teaching subjects, e.g., English, History, Mathematics, Biology and Chemistry, Modern Languages. Other students taking the course would later major in an area outside Education.

In the first week of the semester, students were given a briefing on the broad outlines of the research programme, including a description of the different treatment groups and pre-treatment and post-treatment practice teaching lessons. No individual treatment group was accorded a more positive emphasis or potential than any other group. At the conclusion of this session, the enrolled students were invited to participate in the research programme. All students agreed to do so.

Students were then allocated to treatment groups as follows:

- (a) the population was listed alphabetically,
- (b) a running sequence of numbers 1-142 was associated with this list,
- (c) using a table of random numbers (Peatman, J.G., 1964), two-thirds of the students were allocated to four treatment groups (A,B,C, and D) and one third to a control group E.

In this way the total student population was allocated to treatment groups in a completely random fashion, and from that point it may be assumed that no bias existed between groups in terms of their initial characteristics.

At the point of allocation to experimental groups, the numbers of student teachers in each group were as follows:

treatment group	A	24
treatment group	B	24
treatment group	C	24
treatment group	D	24
treatment group	E	46

Student teachers were subsequently excluded from the analysis of results if they absented themselves from the pre-treatment or post-treatment lesson or from more than one microteaching lesson. The wastage which did occur in this way was spread across each of the treatment groups and did not appear in any way related to the experimental programme.

The residual student numbers in the five groups were:

treatment group	A	22
treatment group	B	20
treatment group	C	16
treatment group	D	21
treatment group	E	42

FACTORIAL DESIGN INCLUDING PRE-TREATMENT AND POST-TREATMENT
LESSONS

Factorial Design

The factorial design is set out below in Tables 10 and 11.

Two comparisons were made:

- (a) a comparison between two groups taking the Stirling programme,
 - (i) one group including practice teaching in the microteaching context; and
 - (ii) the other group not having practice in the microteaching context;

- (b) for groups including practice teaching in the microteaching context, a 2 x 2 factorial experiment to compare the effects of
 - (i) audiotape and videotape replays of practice teaching lessons; and
 - (ii) lesson replays with and without supervision from a staff tutor;and to examine interaction effects between these two feedback variables.

Table 10

Design for Comparison (a)

Practice teaching treatments	
WITHOUT practice in microteaching context N = 42	INCLUDING practice in microteaching context N = 79
Treatment group E	Treatment groups A,B,C,D

Table 11

Design for Comparison (b)

Feedback treatments	Replay by	
Technical feedback Inter- personal feedback	Audiotape	Videotape
Supervision by staff member	N = 22 Treatment group A	N = 16 Treatment group C
No staff member supervision	N = 20 Treatment group B	N = 21 Treatment group D

Pre-treatment Lesson

For all student teachers, an initial measure of performance in the dependent variables was based upon a twelve minute lesson taught during Week 2 of the semester.

This pre-treatment lesson was taught to a group of five pupils and was recorded on audiotape for later analysis. Careful scrutiny was maintained to ensure standardization of the duration of the lesson, the class size, the grade level of pupil, and the classroom setting. Student teachers and pupil groups were allocated quite randomly to the pre-treatment lesson venues.

The specification of task regarding the lesson was given to each student teacher as part of the curriculum seminar programme in the first week of the semester. A full description of the purposes and nature of curriculum seminars will follow (p. 115). However, at this point it may be noted that these seminar groups were centred around teaching subject specialties. Student teachers were given an opportunity to develop lesson materials in an area most suited to their background experience, and appropriate to the microteaching context. The detailed instructions for the pre-treatment lesson were as follows:

Part of your Education 13 programme will consider the different applications of questions in the classroom.

Use this initial lesson to practise asking questions which will help you present your material in such a way that students will understand it, and think for themselves about it.

The complications have already been acknowledged regarding a criterion measure being made prior to an experimental treatment.

Borg et al. (1970) comment on the need for a full listing of expected skills and behaviours to be available to subjects prior to the preliminary measure. It seems impossible to predict the effect of this methodology upon subsequent behaviour both during the treatment phase and in any post-treatment measure. On the other hand, the design would be rendered invalid if subjects were not to comprehend fully what was expected of them in a preliminary measure. Further, this measure must be based on an expectation clearly comparable to that of the post-treatment measures.

In this study, account had to be taken of the presence of a control group in the design. For all groups - and particularly in order that the control group might serve its intended function - the detailed definition of skills and behaviours, and their transformation into a form appropriate for practice in a microteaching context, were considered part of the treatment phase. The instructions setting out the task specification for the pre-treatment lesson were carefully phrased so as to be consistent with both the objectives of the teaching programme and the criterion measures of the research programme.

Previous studies (Borg et al., 1970 ; Gall et al., 1970; and Gall, 1970) have controlled the subject content used in pre-treatment lessons. The stated advantages of such a control must be outlined. Part of the variance in teacher performance in any lesson must be due to the subject content itself. In holding the content constant, the assumption is made that variance in performance due to content will be virtually eliminated. Yet it seems that independent

variables may exist unchecked, in that teachers will vary in their ability to make use of common content material because of their individual background interests and experience. Acheson and Tucker (1971) make a similar point. In a study to measure the increase in teacher use of higher cognitive questions, it is suggested that, with an assigned (common) topic, the occurrence of higher cognitive questions may well be a function of the chosen topic. Such variance may be quite independent of the teacher's abilities which the coded behaviours are intended to reflect.

In this experimental programme, common subject content was not required as a basis for the pre-treatment lesson. The research was conducted in an on-going tertiary teaching programme with a complexity of objectives and demands. Student teacher development in specialist school curriculum areas was a significant objective alongside the practice teaching objectives. Holding constant the pre-treatment lesson content would have clashed with the curriculum development objective, and in this respect the objectives of the total education course precluded the use of standardized content even should this have seemed desirable.

It should be reiterated that the process of random allocation of student teachers into experimental groups should ensure that any bias towards a particular experimental group resultant from the subject content of the lesson would itself be limited to purely random differences.

Post-treatment lesson

For all student teachers, a final measure of performance in the dependent variables was based upon a twelve minute lesson taught in

- (a) weeks 9 and 10 of the Stage 1 programme, and
- (b) week 9 of the Stage 2 programme.

The procedures adopted for the post-treatment lesson were identical to those just described for the pre-treatment lesson.

TEACHING PROGRAMMES

Stirling Programme

Lecture, seminar and practice teaching programme

Student teachers in all treatment groups A, B, C, D, and E attended the full lecture and seminar programme offered in the Stirling course.

Lecture programme

The course was concerned with five aspects of teaching and, related to each theoretical aspect, with a teaching skill to be practised in the microteaching context.

The five aspects and related skills were:

- (i) Perception and attention in the classroom/Varying the stimulus
- (ii) Person perception and feedback in social interaction/Questioning for feedback
- (iii) Problem solving and higher cognitive objectives/Probing and higher order questioning
- (iv) Concept attainment and development/Use of examples
- (v) Language and logic of teaching/Clarity of Explanation

(Memo 12 September 1972, D.I. McIntyre, to all staff members)

Each aspect and skill was covered over a two week period involving four lectures. In one lecture each week, a general introduction was given in terms of psychological theory. In the second lecture each week, the teaching skill was defined and exemplified, and practice was given in the use of systematic observation procedures designed to assist the student teacher to identify the skill. In the following two weeks, the skill was practised by the student teacher in the microteaching context. In the same period, the next aspect of teaching was covered in the lecture programme.

Seminar programme

For each aspect of teaching, one theory seminar was devoted to reinforcing the theoretical component of the lecture material. A second seminar, the curriculum seminar, was largely devoted to the development of the student teacher's knowledge and understanding of curriculum construction and secondary school curricula, and particularly in regard to the preparation and presentation of subject material for micro-teaching lessons. The suggested purposes of the seminar were as follows:

- (a) to elaborate on the defined skills from the point of view of the teacher of a particular subject, especially by giving examples of distinctive ways in which the skills could fruitfully be used in teaching that subject;
- (b) to ensure that students understood the defined skill to the extent that they could apply the given performance criteria to their own teaching;

- (c) to identify, through discussion with students, a variety of topics or kinds of lesson appropriate for practising the skill in the microteaching context;
- (d) to establish a broad foundation for curriculum work planned for later semesters.

Seminar groups were based upon the specialist teaching subject areas of English, History, Mathematics, Modern Languages, and Science. In this way, the skills relevant to this research were introduced, i.e., 'Questioning for feedback,' and 'Probing and higher order questioning'. Materials distributed to student teachers (Appendices A-C) emphasized the following facets of these skills:

(a) Questioning for feedback

1. Untested assumptions about pupils

- pupil background knowledge and experience

2. (i) Types of question

- to test knowledge
- to test comprehension
- to assess interests and attitudes
- to encourage pupils to contribute their own experience and ideas

(ii) Pupil responses

- pupil participation
- distribution of questions

3. Inadequate questions

- lack of definition
- leading questions

4. Lack of attention to pupil response

(b) Probing and higher order questioning

1. Higher order questioning

- lower order questions
- application questions

(corresponding to Bloom's categories of comprehension and application)

- synthesis questions

(corresponding to Bloom's categories of analysis and synthesis)

2. Probing

- clarification, elaboration, justification
- prompt (cue)

Practice teaching, including organizational details of its components

For those treatment groups participating in practice teaching, each skill was practised for twelve minutes in a microteaching lesson with five pupils.

Practice of these skills set student teachers the task of demonstrating their ability to apply the various facets of these skills in a microteaching lesson.

Feedback was available to the student teacher following this practice. Approximately one day later, the student teacher participated in a reteach lesson, again of twelve minutes duration, with five pupils and subsequent feedback.

As with the pre- and post-treatment lessons, steps were taken to ensure the standardization of factors such as the length of the lesson, class size, grade level, and microteaching classroom setting.

Student teachers

During Week 1 of the semester, student teachers were introduced to the idea of practice teaching in the microteaching context. Videotape recordings of practice teaching in the microteaching context were shown to students during the first week's lecture programme. The microteaching classrooms and recording equipment were open to view by the students. Support was readily available from staff in the seminar programme to assist in the preparation of lesson materials.

In these ways an attempt was made to reduce any anxiety felt by students when facing a new situation, or by the self-confrontation aspect of videotape replays.

Pupil population of microteaching classrooms

It must be stated that the prior knowledge and/or the degree of responsiveness of pupils participating in practice teaching lessons in the microteaching context must have some impact on the measures made of performance of student teacher and pupil behaviours.

Reported studies vary in their ability to exert some form of control over the pupil population used in the microteaching lessons. Some researchers have reported matching of pupil groups on the basis of prior knowledge measures, and others have maintained or attempted to maintain pupil groups constant through the teach-reteach cycle (Borg, 1970).

For the present study, a full class of approximately thirty pupils, both boys and girls, generally junior secondary level, were brought by bus to the university with their regular class

teacher for a half-day period. No one class of pupils attended the university more than once in a semester. Within a holding room, the regular class teacher was able to pursue the semblances of a normal teaching day, whilst the pupils, in groups of five, were shuttled backwards and forwards to the microteaching classrooms. A group of five pupils would be involved in three or four successive practice teaching lessons after which they would be replaced by another group of pupils. The reteach lesson, usually one or two days later, was always taught to a different group of pupils.

Procedures which matched pupil groups or maintained constant groups for both teach and reteach sessions were quite impracticable in this study. This decision was taken bearing in mind such factors as the size and duration of the full semester microteaching schedule, relationships between local schools and the university department, and the demands which any other course of action would make upon the schools and their pupils.

The timetabling of practice teaching lessons in the microteaching context was in no way related to experimental treatment groups, and the allocation of pupils to microteaching classrooms was completely random except that each pupil group was selected to include both boys and girls. Every attempt was made to spread the task as evenly as possible over the whole class.

The random allocation of student teachers to microteaching lesson times, together with the random selection of pupils for microclasses, ensured that no systematic bias would operate towards any experimental group.

Supervision of practice teaching lessons by a staff member/tutor

Separate research was being conducted at Stirling in 1972-3 exploring factors related to the effectiveness of various modes of supervision/review of student teachers' practice teaching lessons, and in order to allow this work to proceed without interference, the present study adopted a fairly traditional approach to the pattern of supervision employed.

Earlier work at Stirling by McIntyre and Duthie (1972) supported discussions between supervisor and student, although the benefits appeared related to matters of student teacher morale, staff member role expectations and attitudes to the practice teaching lessons rather than to any measured changes in student teacher behaviour in the practice classroom. Similar results were reported by Johnson and Knaupp (1970). Rezler and Anderson (1971) noted that a focussed review session was more effective than general discussion.

Whilst details of the review session were inextricably linked to a variety of factors such as the particular student teacher or the subject content of the lesson, yet in this experimental programme an attempt was made to establish consistency in the fifteen minute review session by supervisors adopting the following sequence of behaviours:

- (i) to view the lesson on television while it was being taught and then also to view the replay of it with the student;
- (ii) to code the lesson (on either first or second viewing) in terms of the systematic observation procedure provided

- (iii) to encourage the student to code the lesson in terms of the systematic observation procedure;
- (iv) to encourage the student to evaluate the strengths and weaknesses of his teaching and to formulate desirable modifications and alternative plans where necessary;
- (v) to concentrate the discussion largely (but not necessarily entirely) on the skill being practised;
- (vi) to attempt to base as much of the discussion as possible on the systematic coding of the lesson, on interpretations of this coding, and on differences between the tutor's and the student's coding,
- (vii) to concentrate not only on the weaknesses in a student's teaching but also, whenever possible, to reinforce the strengths,
- (viii) to limit the joint evaluation of the lesson by tutor and student to about three or four main points;
- (ix) to reach agreement with the student as to the main criteria in terms of which an assessment of performance in the reteach would be made.

Beyond these guidelines, general variations in approach by staff tutors would be spread across all treatment groups, and the assumption was held that no particular advantage or disadvantage would accrue to any single treatment group. It is possible that tutor behaviour might have been systematically different between audiotape and videotape feedback groups, but such differences would have been the result of the different types of technical feedback and therefore part of the differences in treatment, the effects of which form part of the present study.

Text cut off in original

Practice teaching, pre- and post-treatment lesson recordingMicroteaching classroom

(Stage 1 and Stage 2 experimental programme)

(a) Recording

Three classrooms and adjoining preview/replay rooms were available for recording purposes for all parts of the experimental programme. The layout of each classroom followed the plan set out in Figure 2.

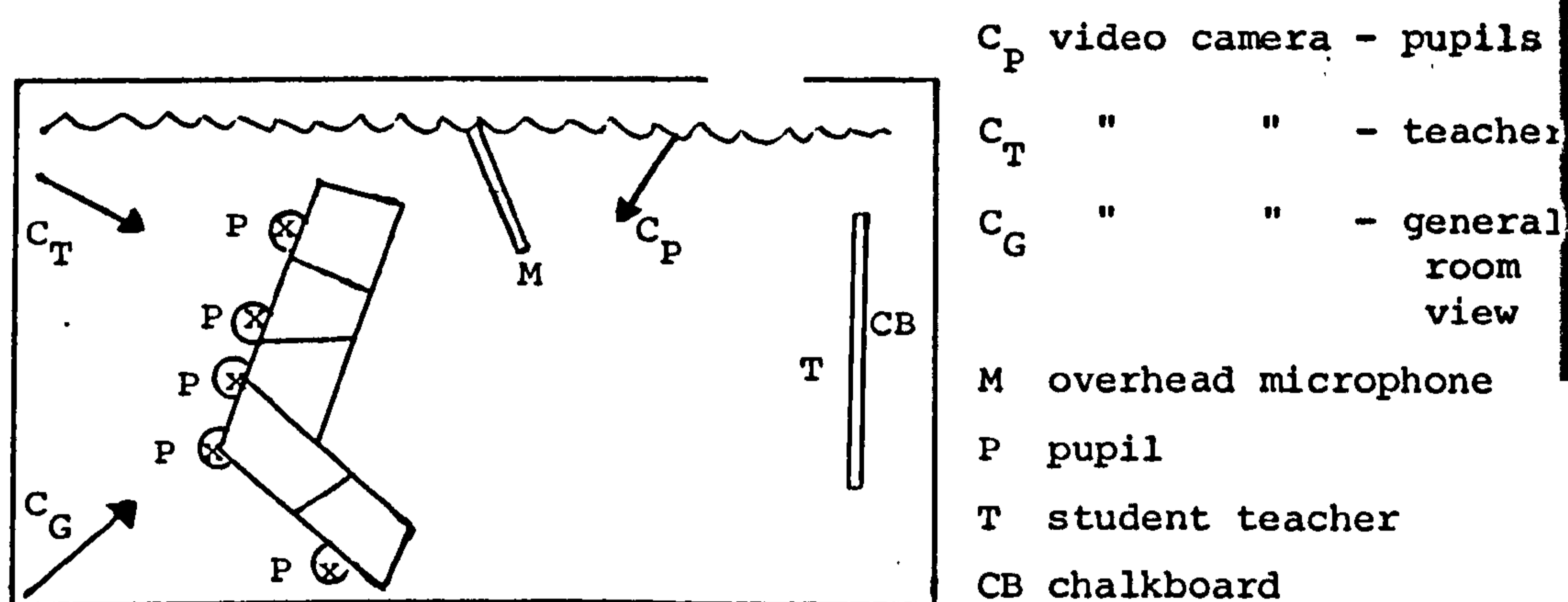


Figure 2
Microteaching Classroom

Each classroom was equipped with:

(i) three video cameras

C_P camera on pupils in seated position

C_T camera on teacher either sitting or standing

C_G camera giving wide angle view

of classroom to follow any variation in classroom activity from the fixed positions;

- (ii) a microphone M to gather a sound recording of student teacher and pupil talk.

Pictures and sound were relayed to a control room where technical staff operated videorecording equipment.

In the case of pre-treatment and post-treatment lessons, a simultaneous cassette audiotape recording was made;

- (iii) individual tables and chairs to seat five pupils.

Writing, or other materials, were provided as needed;

- (iv) a chalkboard, and when required, portable wet facilities for science-type lessons.

General consistency in the visual record of lessons was obtained by instructing technical staff to record a split screen picture whenever possible. This picture would give a hand and shoulders view of the five pupils in the upper half of the picture, and student teacher and chalkboard in the lower half of the picture (see Figure 3).

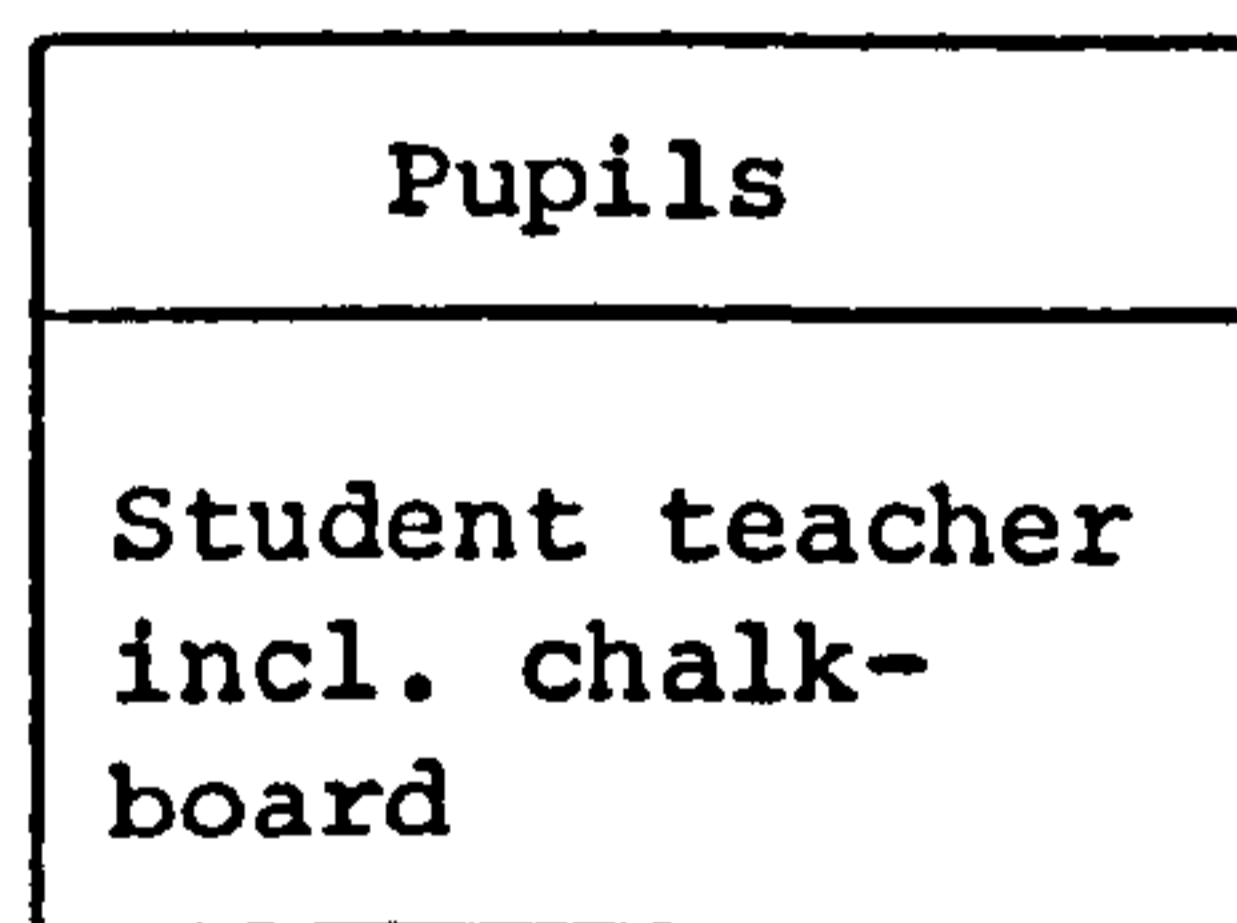


Figure 3
Recorded Picture of Practice Teaching Lessons

Recorded picture of practice teaching lessons

For staff members participating in the experimental programme as supervisors, provision was made in the preview/replay rooms for the viewing on a video monitor of the lesson being taught. In

the case of staff members associated with treatment groups receiving audiotape replays only, the staff member preview was in the form of a live audio transmission.

(b) Replay

At the conclusion of a practice teaching lesson, a replay was immediately available to the student teacher and, where appropriate, to the staff member acting as a supervisor/tutor. Each replay room was equipped with a video monitor.

The replay was facilitated by technical staff in the control room, and within organizational limits could be stopped, restarted, or replayed, as desired.

For treatment groups receiving practice teaching replays by audiotape only, no picture was transmitted through the video monitor.

SEMESTER ORGANIZATION

The experimental programme was conducted during a fourteen week semester. The schedule of semester activities is set out below.

Weeks 1 and 2

- . Introduction to the course and commencement of the lecture and seminar programme;
- . Orientation to the microteaching format for the practice of teaching skills;
- . Course members briefed on research/experimental programme and invited to participate;
- . Preparation in seminar (curriculum centred) for the pre-treatment lesson.

Weeks 2 and 3

- . Each student teacher taught a twelve minute pre-treatment lesson (no feedback);
- . Introduction in lectures/seminars to a teaching skill
(Note: This skill, "Varying the stimulus", was not part of the research programme.)

Weeks 3-5

- . Practice in the microteaching context, by all course members, of the skill "Varying the stimulus";
- . Introduction in lectures/seminars to the teaching skill "Questioning for feedback".

Weeks 5-7

- . Treatment groups A, B, C, and D carried out practice teaching in the microteaching context of the skill "Questioning for feedback";
- . Introduction in lectures/seminars to the teaching skill "Higher order questioning".

Weeks 7-9

- . Treatment groups A, B, C, and D carried out practice teaching in the microteaching context of the skill "Higher order questioning";
- . Preparation in seminars (curriculum centred) for the post-treatment lesson.

Weeks 9 and 10

Every course member taught a twelve minute post-treatment lesson.

Weeks 10-13

Course programme continued for all members outside the framework of the research programme.

EXPERIMENTAL TREATMENTS

The treatments which formed the experimental design consisted of four feedback treatments and two practice treatments.

Treatment group A

For student teachers in this group, feedback from the teach and reteach microteaching lessons was provided in the form of an audiotape recording of the lesson. As well, a staff member/tutor observed the lesson on a video monitor as it was taught. At the conclusion of the lesson a review session of approximately thirty minutes was held, during which the audiotape of the lesson was replayed and the staff tutor discussed the lesson with the student teacher.

Treatment group B

The student teacher was provided with feedback in the form of an audiotape recording of the lesson, as were members of group A. For members of group B, no staff member/tutor was present in the review session. The student teachers conducted their own reviews based upon guidelines given in lecture material.

Treatment group C

Feedback for both the teach and reteach microteaching lessons was provided in the form of a videotape recording of the lesson. A staff member/tutor observed the lesson and participated in the review session as for group A.

Treatment group D

Feedback was provided in the form of a videotape recording as for members of group C. No staff member/tutor was available during the review sessions. In this latter respect, the treatment for group D was identical to group B.

Treatment group E

Student teachers allocated to group E acted as a control group to the other four treatment groups A, B, C, and D.

Members of group E attended the same lecture and seminar programme as the other groups, but they did not practise either of the relevant skills in microteaching sessions.

For this group, any changes of performance in the dependent variables must result from factors outside the practice situation.

Stage 2, Autumn Semester 1972

EXPERIMENTAL SAMPLE

Sixty-one students enrolled for the introductory education course (Education 13). The general characteristics of this student population were similar to those for the population in the Spring semester 1972, previously described (p. 107).

Following procedures also reported earlier in this chapter (p. 107), the students were allocated in a completely random way to one of eight treatment groups. There were either seven or eight students in each group.

For the period of this research four of these groups took the Stirling programme. The other four groups took the Alternative programme. At all other times during the semester, there was no differentiation of students in the programme followed. The random allocation of the total population to treatment groups once again permitted the assumption to be made that no bias would be expected between groups in terms of their initial characteristics.

Adopting the same criterion for wastage as outlined for Stage 1, no wastage of student teachers occurred during the period of the experimental programme.

FACTORIAL DESIGN INCLUDING PRE-TREATMENT AND POST-TREATMENT LESSONS

Factorial Design

The Stage 2 factorial design is set out below in Tables 12-17.

The design consisted of a 2 x 2 x 2 factorial experiment.

(a) Three main effect comparisons were made:

- (i) a comparison of the effects of two practice teaching treatments;
- (ii) a comparison of the effects of the two technical feedback treatments (replay format);
- (iii) a comparison of the effects of the two inter-personal feedback treatments (supervision format).

Table 12

Design for Comparison (a) (i)

Teaching programme	Stirling programme N = 31	Alternative programme N = 30

Table 13

Design for Comparison (a) (ii)

Technical feedback	replay by	
	Audiotape N = 31	Videotape N = 30

Table 14

Design for Comparison (a) (iii)

Supervision by a staff member/tutor N = 32	No staff member/tutor supervision N = 29
---	---

(b) Three major interactions were studied as 2 x 2 factorial experiments:

- (i) the interaction between the practice teaching and replay format variables;
- (ii) the interaction between the practice teaching and supervision format variables;
- (iii) the interaction between the replay format and supervision format variables.

These experiments are set down in Tables 15-17 below.

Table 15

Design for Comparison (b) (i)

	Technical feed-back treatments	Audiotape replay	Videotape replay
Teaching programmes	Stirling programme	N = 16	N = 15
	Alternative programme	N = 15	N = 15

Table 16

Design for Comparison (b) (ii)

	Inter-personal feedback treatments	Supervision by a staff member/tutor	No staff member supervision
Teaching programmes	Stirling programme	N = 16	N = 15
	Alternative programme	N = 16	N = 14

Table 17

Design for Comparison (b) (iii)

Feedback treatment		
Inter-personal feedback treat- ments Technical feedback treatments	Supervision by a staff member/tutor	No staff member supervision
Audiotape replay	N = 16	N = 15
Videotape replay	N = 16	N = 14

- (c) Further, any interactions between the main effect variables were studied (practice teaching, replay format, supervision format).

Pre-treatment and Post-treatment Lessons

The details of these lessons followed exactly the description given for the Stage 1 study in Spring semester 1972 (p.111).

TEACHING PROGRAMMES

Stirling Programme

The details of the lecture programme, the seminar programme, and the practice teaching programme followed the pattern set down for the Spring semester programme (see p. 114). Every endeavour was made by staff to duplicate the programme of the earlier semester, including details of the organization of teaching practice in the microteaching context.

Alternative Programme

Lecture programme

The Stirling programme and the Alternative programme had common objectives. For the fourteen week semester, the general teaching pattern followed was two lectures and one seminar per week, plus practice teaching in the microteaching context as appropriate.

The theoretical aspects of teaching listed for the Stirling programme were offered to both groups in a common lecture hour each week. During the experimental phase of the semester programme (weeks 4-8), the Alternative programme groups were given separate activities in the second lecture hour each week. This programme related closely to the skills to be practised in microteaching lessons. The basic characteristics of the presentation of materials in the Alternative programme have been described in Chapter I (see p. 35), and reference to the week-by-week details will be found in the section which follows on semester organization. However, the general pattern of presentation for each specified teaching behaviour objective was as follows:

1. rationale for behaviour;
2. presentation of examples of the behaviours demonstrated in given stimulus materials;
3. from given stimulus materials, practice in writing examples of the specified behaviour;
4. viewing of cued film sequences demonstrating the specific behaviours in classroom situations;
5. practice in the identification of the behaviours in transcripts of classroom discussion.

Seminar programme

Student teachers from the Stirling programme and the Alternative programme were mixed together in the seminar situation. One seminar was devoted to a consolidation of the theoretical aspects of the course; the second seminar concentrated on the preparation of lesson materials for the practice teaching. In this later seminar, students were grouped by specialist teaching subject areas.

No strict control was maintained over the conduct of seminars. General guidelines for the conduct of seminars were issued to staff, encouraging them to give individual assistance to students in thinking about school curricula and choosing appropriate materials for the microteaching lessons.

Practice teaching

A study of the hand-out materials relevant to the Stirling programme and to the Alternative programme (see Appendices A-D) would reveal that, in the practice teaching arrangements, the presentation of the Stirling programme allowed for two teach-reteach cycles, one cycle associated with the practice of the skill "Questioning for feedback" and the other with the practice of the skill "Probing and higher order questioning". The presentation of the materials of the Alternative programme covering the practice of both of these skill areas allowed for three teach-reteach cycles. In order that the total time spent practice teaching in the microteaching context be the same for student teachers in all treatment groups, the Stirling microteaching lessons were twelve minutes in duration, whilst the Alternative programme microteaching lessons were timed at eight minutes.

It was not anticipated that any advantage or disadvantage would accrue to any experimental group as a result of this difference in programme format. The arrangement of the practice teaching situation was closely linked with the differences in presentation of theoretical material to members of the two programmes.

In all other respects, the teaching practice organization followed that set down for the Stage 1 research (see p.117).

SEMESTER ORGANIZATION

The experimental programme was conducted during a fourteen week semester. The schedule of semester activities for both the Stirling programme and the Alternative programme is set out in Figure 4 below.

FIGURE 4

Stage 2 Autumn Semester 1972 Schedules

	Practice teaching treatment		Practice teaching in microteaching context
	Stirling programme	Alternative programme	
Weeks 1, 2	<ul style="list-style-type: none"> . Introduction to the course; . Commencement of lecture/seminar programme; . Orientation to microteaching format for the practice of teaching skills; <p>Common to all groups</p> <ul style="list-style-type: none"> . Course members briefed on experimental programme and invited to participate; . Preparation in seminar (curriculum centred) for pre-treatment lesson. 		
Weeks 2, 3	<ul style="list-style-type: none"> . Every course member teaches a twelve minute pre-treatment lesson . Introduction in lectures/seminars to a teaching skill (Varying the stimulus) <p>Note: This skill is not part of the research programme</p>		<p>Pre-treatment lesson 12 minutes</p> <p>Practise skill "Varying the stimulus"</p>

FIGURE 4 (continued)

Practice teaching treatment		Practice teaching in microteaching context
Stirling programme	Alternative programme	
<p>Week 4</p> <ul style="list-style-type: none"> • Theory lecture common to all groups • Lecture <p>Introduction to the teaching skill "Questioning for feedback"</p> <ul style="list-style-type: none"> (a) untested assumptions about pupils (b) types of question (c) inadequate questions (d) lack of attention to pupil responses (e) exercises in the use of the coding instrument (Appendix A) 	<p>Introduction to questioning/ response behaviours</p> <ul style="list-style-type: none"> (a) knowledge, comprehension and application questions (b) improving the quality of pupil answers (c) related exercises and viewing of model film sequence (Appendix D) 	<p>Teach-reteach cycle each lesson 12 minutes</p>
<ul style="list-style-type: none"> • Seminar relevant to lecture material 		

FIGURE 4 (continued)

Practice teaching treatment		Practice teaching in microteaching context	
Stirling programme	Alternative programme	Stirling	Alternative
<p>Weeks 5, 6</p> <ul style="list-style-type: none"> • Theory lectures common to all groups • Lectures <p>Introduction to the teaching skill "Probing and higher order questioning"</p> <p>(a) types of questions</p> <ul style="list-style-type: none"> (i) lower order (ii) application/comprehension (iii) higher order <p>(b) pupils responses, prompting and probing</p> <p>(c) exercises in the use of the coding instrument.</p> <p style="text-align: center;">(Appendix C)</p>	<p>(d) analysis questions</p> <p>(e) synthesis questions</p> <p>(f) related exercises and viewing of model film sequence</p> <p style="text-align: center;">(Appendix D)</p>	<p>Practise skill "Questioning for Feedback"</p> <p>Teach-reteach cycle each lesson 12 minutes</p>	<p>Practise skills</p> <p>(a) probing questions</p> <p>(b) improving student responses teach-reteach cycle each lesson 8 minutes</p> <p>Practise skills</p> <p>(a) analysis questions</p> <p>Teach-reteach cycle each lesson 8 minutes</p>
<ul style="list-style-type: none"> • Seminar <p>Follow-up of theory lecture</p> <p>Preparation for practice teaching</p>			

FIGURE 4 (continued)

	Practice teaching treatment		Practice teaching in microteaching context	
	Stirling programme	Alternative programme	Stirling	Alternative
Weeks 7, 8	<ul style="list-style-type: none"> . Theory lecture common to all groups . Lecture <p>Continuation as for weeks 5, 6</p> <ul style="list-style-type: none"> . Seminar as for weeks 5, 6 . Student teachers and participating staff complete a questionnaire in the period following the final re-teach practice teaching lesson. 	Continuation as for weeks 5, 6	<p>Practise skill</p> <p>"Probing and higher order questions"</p>	<p>Practise skills</p> <p>(a) synthesis questions & continue</p> <p>(b) analysis questions</p> <p>(c) probing questions</p> <p>Teach-reteach cycle each lesson 8 minutes</p>
Weeks 9, 10	<ul style="list-style-type: none"> . Every course member teaches a twelve minute post-treatment lesson. 		Post-treatment lesson 12 minutes	
Weeks 9-14	<ul style="list-style-type: none"> . Stirling programme continues, all activities common to all groups, and outside the framework of the research study. 			

EXPERIMENTAL TREATMENTS

The experimental design permitted a study to be made of the independent effects of three variables: the differential effects of two programme variants, the differential effects of two variants of inter-personal feedback, and the differential effects of two variants of technical feedback.

Teaching Programme Treatments

- (a) Stirling programme including practice in the microteaching context; and
- (b) Alternative programme including practice in the microteaching context.

Technical Feedback Treatments

- (a) audiotape replays following microteaching lessons;
- (b) videotape replays following microteaching lessons.

Inter-personal Feedback Treatments

- (a) videotape replays together with supervision from a staff member/tutor;
- (b) videotape replays without supervision from a staff member/tutor.

From the random allocation of the total student population into eight treatment groups, the first four groups were designated the Stirling programme. These four treatment groups correspond to the four possible combinations of feedback treatments found in the description set down for treatment groups A, B, C and D in the Stage 1 study (see p.126).

The second four groups were designated the Alternative programme. Each of these groups paralleled a treatment group in the Stirling programme.

PARTICIPANTS ATTITUDES TO THE PROGRAMME

Two questionnaires were administered at the end of the experimental programmes (week 8).

The first questionnaire was administered to all students, the second questionnaire to staff participating in the experimental programmes as supervisors in the practice teaching experiences. In both cases the purpose of the questionnaire was to gather evidence of participants' reactions to the objectives of the teaching programme related to questioning/response behaviours, and to the various treatment programmes designed to achieve these objectives.

The questionnaires were distributed following the final practice teaching lesson and returned at the post-treatment lesson. With the exception of one question on the students' questionnaire, all responses were made prior to the post-treatment lesson.

Stage 3, Spring Semester 1973

EXPERIMENTAL SAMPLE

Two hundred and three students began the introductory course in education (Education 13) in 1972. One hundred and forty-two students took the course in the Spring semester, sixty-one in the Autumn semester.

Only students making a commitment to a major study in education continued with their studies in this area beyond the introductory course. To this important extent, the student teacher population participating in the Spring semester 1973 experimental programme was a biased sample of those taking the introductory course. It was quite possible that some students' reactions to the introductory course influenced their decision about whether or not to continue the education programme as a professional preparation for teaching. A survey of the enrolment pattern for the Spring semester 1973 programme suggested that the differential experimental treatments had not significantly influenced this decision, except possibly for the audiotape/videotape groups from the Spring semester 1972 programme.

Even this difference, however, could well have been due to chance and, especially since the corresponding difference between Autumn semester groups was in the opposite direction, it seemed reasonable to suggest that the evidence permitted a testing of the research questions for an unbiased sample of those who, for reasons not related to the experimental treatments, had decided to take the professional teacher preparation programme.

Fifty students from the Spring semester 1972 course continued with the next education course (Education 14) in the Spring semester 1973.

Thirty students from the Autumn semester course continued with the next education course (Education 14) in the Spring semester 1973. In both cases this proportion of continuing students approximates to that recorded before and since.

FACTORIAL DESIGN

The student population included members of all of the treatment groups of the Stage 1 and Stage 2 experimental programmes.

The Stage 3 factorial design is set out below in Table 18.

Table 18

Stage 3 Factorial Design

(a) from the Spring semester 1972

		Practice teaching treatments	
Stirling programme	WITHOUT practice in microteaching context N = 17	INCLUDING practice in microteaching context N = 33	

Feedback treatments		Technical Feedback	
		Replay by Audiotape	Replay by Videotape
Inter-personal feedback	Supervision by staff member	N = 7	N = 9
	No staff member supervision	N = 6	N = 11

(b) from the Autumn semester 1972

(i) main effects

Programmes	Stirling programme	Alternative programme
	N = 15	N = 15

Technical Feedback Treatment	Replay by	
	Audiotape N = 16	Videotape N = 14

Inter-personal Feedback Treatments	Supervision by a staff member N = 17	No staff member supervision N = 13
------------------------------------	---	---------------------------------------

(ii) major interaction effects

Technical feedback Programme	Audiotape replay	Videotape replay
Stirling programme	N = 9	N = 6
Alternative programme	N = 7	N = 8

Inter-personal feedback Programme	Supervision by a staff member	No staff member supervision
Stirling programme	N = 9	N = 6
Alternative programme	N = 8	N = 7

	Feedback treatments	Inter-personal feedback	
		Supervision by a staff member	No staff member supervision
Technical Feedback	Audiotape replay	N = 8	N = 8
	Videotape replay	N = 9	N = 5

Comparisons were made of the performance in the dependent variables:

- (a) among the treatment groups as set down for the Stage 1 study (see p.126) and the Stage 2 study.

Because of the smaller numbers, however, no significance is to be attached to any interaction effects found among all three variables in this stage;

- (b) between two practice teaching contexts

- (i) practice in the microteaching context;
(ii) practice in a primary school classroom.

EXPERIMENTAL TREATMENT AND ORGANIZATIONAL DETAILS

Prior to the commencement of the Education 14 course, all students participated in a three week practice teaching experience in a local primary school. The stated objective of this experience was "to provide students with a picture of what currently happens to their pupils before (coming) to them in secondary school".

(University of Stirling, Department of Education, The Present Education Courses. Mimeograph; undated). Placement

of the students in a primary school took into account home location. The practice was divided between experience in the infants, junior, and senior stages of the primary school. The students spent

most of their time observing and supporting the regular classroom teachers. However they did take over some teaching functions towards the final week of the practice teaching.

During this week each student prepared and taught a discussion-type lesson appropriate to the current activities of the class. The lesson took place in a regular classroom, with a class of 25-35 pupils, generally in grades 6 or 7. The specification of the task was given to each student teacher prior to the school experience and Stirling staff made themselves available to students requesting assistance in the preparation of the lesson materials. The details of the task specification followed exactly the instructions given to students for the pre-treatment and post-treatment lessons (see p.111).

Prior to the actual forty-minute lesson, the student teacher indicated to the staff tutor the segment of the lesson in which they would practise those behaviours previously practised in the micro-teaching context. This twelve-minute segment was recorded on audiotape and used as a basis for deriving measures of performance in the the primary school classroom. The recording was made by feeding sound into a cassette recorder from two microphone sources. One microphone, recording student teacher talk, was looped around the teacher's neck and included an extension lead in order that the student teacher could move freely about the classroom. The second microphone was in a fixed position and able to record pupil verbal behaviour. Measures of teacher and pupil behaviours obtained in this way were compared across treatment groups as designated for this Spring semester and to the previous performance of these groups in the microteaching context.

PARTICIPANTS ATTITUDES TO PRACTICE TEACHING EXPERIENCES

With the exception of those student teachers who had not experienced teaching practice in the microteaching context i.e., treatment group E, Spring semester 1972, all other students participating in the practice teaching experience in the primary school classroom were invited to complete a questionnaire.

The questionnaire contained a single open-ended question asking for comparison and comment of practice teaching in the microteaching context and in the primary school situation.

The questionnaire was given to student teachers at the conclusion of their practice teaching experience and returned one week later.

Summary

A three-stage experimental design has been outlined; the first two stages focussed upon practice teaching in the microteaching context and measured criterion behaviours of student teachers and pupils in two programmes of teacher education. The context of the third stage shifted to primary school classrooms where similar measures were made.

By randomization of subjects to experimental groups, it was possible to discount any initial differences between groups which might have influenced the criterion measures.

In the first two stages, a post-treatment lesson formed the basis for an analysis of the effects of different experimental treatments. In the third stage a segment of a lesson taught in a primary classroom served a similar purpose. A pre-treatment measure of performance was obtained so that it would be possible to analyze the full experimental results by analysis of covariance, and to provide data of any gains made in performances following the treatment programme.

CHAPTER IV
ANALYSIS OF RESULTS RELATING TO
TEACHER AND PUPIL BEHAVIOURS

In this chapter, hypotheses will be tested relating to student teacher questioning behaviours and pupil response behaviours both in the microteaching context and in the school classroom. The analysis of data will be presented in stages which correspond to the experimental programme:

Spring semester 1972 - one group of student teachers took the full Stirling programme, whilst a second group acted as a control group and did not participate in the practice teaching lessons;

Autumn semester 1972 - the student teacher population was divided into two groups, one taking the full Stirling programme, the other group taking the Alternative programme;

Spring semester 1973 - student teachers participated in a practice teaching experience in a primary school classroom.

The framework upon which the statistical analysis was built has already been described in Chapter III. A major basis of the experimental design was the random allocation of student teachers to treatment groups, thus permitting the researcher to disregard potential differences between groups prior to the experimental treatments. Within the groups, consistent individual differences across the pre-treatment and post-treatment measures were to be accounted for by means of analyses of covariance.

Value of Analysis of Covariance

Before proceeding with such an analysis, it was appropriate to test the assumption of a correlation between pre-treatment and post-treatment measures. For both the Spring semester 1972 population and the Autumn semester 1972 population, calculations were made of a product-moment correlation between total frequencies of occurrence of the criterion teacher and pupil behaviours with all 104 coded pre-treatment teacher and pupil behaviours.

Tables 19 and 20 report the results of this analysis: Table 19 the Spring semester and Table 20 the Autumn semester. For each of the listed criterion behaviours, there is shown

- (a) the correlation of the post-treatment measure with the pre-treatment measure of the same behaviour;
- (b) the quartile points of the product-moment correlations of all 104 coded pre-treatment measures with the post-treatment measure of the listed behaviour;
- (c) the frequency of correlations with a value $\geq .3$.

Table 19

Product-moment Correlations between Pre-treatment and Post-treatment Behaviours

Spring Semester 1972

Criterion behaviours	Product-moment correlation of pre-treatment behaviours with post-treatment behaviour				Number of correlations $\geq .3$
	Corresponding pre-treatment behaviour	Quartile points all other coded behaviours			
		Q ₁	Q ₂	Q ₃	
<u>Questioning behaviours</u>					
knowledge questions	.19	-0.05	.03	.10	0
comprehension "	.26	.02	.08	.16	3
application "	-0.06	-0.04	.03	.16	11
analysis "	-0.07	-0.08	-0.03	.04	0
synthesis "	.01	-0.04	.02	.07	0
lower order synthesis "	.16	-0.06	.02	.10	0
total these questions	.19	-0.02	.07	.16	0
knowledge (questions (probes (prompts	.20	-0.05	.03	.11	0
comprehension "	.22	.03	.08	.15	0
application "	-0.08	-0.03	.05	.16	8
analysis "	-0.06	-0.08	-0.03	.06	3
synthesis "	.04	-0.04	.01	.07	0
lower order synthesis	.13	-0.06	.02	.09	0
total all (questions (probes (prompts	.16	.02	.08	.16	0
analysis plus synthesis questions	.11	-0.06	0.00	.07	0

Table 19 (continued)

Criterion behaviours	Product-moment correlation of pre-treatment behaviours with post-treatment behaviour				Number of correlations ≥.3
	Corresponding pre-treatment behaviour	Quartile points all other coded behaviours			
		Q ₁	Q ₂	Q ₃	
comprehension, application, analysis, and synthesis questions	.22	.02	.06	.16	0
<u>Response behaviours</u>					
original responses	.13	-0.06	.01	.09	0
supported "	.03	-0.04	.03	.12	1
original and supported "	.13	-0.06	.02	.09	0
analysis and synthesis questions followed by					
. original responses	.03	-0.06	-0.05	.04	0
. supported responses	.05	-0.04	.01	.08	0
. original and supported responses	.14	-0.05	.03	.10	1
<u>Teacher/pupil interaction behaviours</u>					
total "no opportunity to respond"	.19	-0.04	.02	.09	0
total "no response"	.04	0.00	.06	.12	0
total prompts	-0.00	-0.01	.05	.12	2
total "no response followed by a prompt"	.07	-0.03	.07	.15	0
analysis and synthesis questions followed by a "no response" and "prompt"	-0.12	0.04	.02	.08	0

Table 19 (continued)

Criterion behaviours	Product-moment correlation of pre-treatment behaviours with post-treatment behaviour				Number of correlations $\geq .3$
	Corresponding pre-treatment behaviour	Quartile points all other coded behaviours			
		Q ₁	Q ₂	Q ₃	
Total probes	.15	-0.06	.01	.09	1
Analysis and synthesis questions followed by a probe	.02	-0.06	0.00	.07	0

Table 20

Product-moment Correlations between Pre-Treatment
and Post-Treatment Behaviours

Autumn Semester 1972

Criterion behaviours	Product-moment correlation of pre-treatment behaviours with post-treatment behaviour				Number of correlations $\geq .3$
	Corresponding pre-treatment behaviour	Quartile points all other coded behaviours			
		Q ₁	Q ₂	Q ₃	
<u>Questioning behaviours</u>					
knowledge questions	-0.05	0.00	.07	.22	16
comprehension "	-0.02	-0.07	0.00	.10	3
application "	-0.03	-0.05	.03	.16	7
analysis "	.02	-0.06	.01	.02	0
synthesis "	.15	-0.05	.05	.17	10
lower order synthesis	.09	-0.15	-0.04	.05	0
total these questions	.13	.01	.09	.18	2
knowledge (questions (probes (prompts	-0.07	0.00	.08	.23	16
comprehension "	0.00	-0.08	0.00	.09	3
application "	-0.04	-0.06	.02	.15	7
analysis "	.04	-0.05	.01	.08	0
synthesis "	.16	-0.04	.06	.20	10
lower order synthesis	.08	-0.16	-0.05	.05	0
total all (questions (probes (prompts	.10	.02	.08	.19	2
analysis plus synthesis questions	.01	-0.03	.05	.11	0
comprehension) application) analysis) questions synthesis)	-0.03	-0.05	.03	.10	4

Table 20 (continued)

Criterion behaviours	Product-moment correlation of pre-treatment behaviours with post-treatment behaviour				Number of correlations $\geq .3$
	Corresponding pre-treatment behaviour	Quartile points all other coded behaviours			
		Q ₁	Q ₂	Q ₃	
<u>Response behaviours</u>					
original responses	-0.18	-0.11	-0.04	.11	9
supported responses	-0.05	-0.11	-0.03	.08	0
original and supported responses	-0.14	-0.14	-0.05	.06	3
analysis and synthesis questions followed by					
.original responses	.04	-0.08	-0.02	.14	11
.supported responses	0.00	-0.08	-0.03	.03	0
.original and supported responses	-0.16	-0.11	-0.05	.03	0
<u>Teacher/pupil interaction behaviours</u>					
total "no opportunity to respond"	-0.08	-0.08	.04	.14	0
total "no response"	-0.10	-0.08	-0.02	.08	0
total prompts	.12	-0.06	.03	.14	3
total "no response followed by a prompt"	.04	-0.06	.03	.12	2
analysis and synthesis questions followed by a "no response and prompt"	.10	-0.03	.05	.13	3
total probes	-0.18	-0.12	.01	.08	2
analysis and synthesis questions followed by a probe	-0.12	-0.09	.01	.08	0

For the Spring semester, the correlation of the criterion measure of behaviour with the corresponding pre-treatment measure exceeded 0.2 on only four occasions. The teacher behaviour "asking comprehension questions" was common to three of those occasions. There thus seemed to be a very slight tendency for those who asked more "comprehension questions", and also for those who asked more "knowledge questions" and "lower order synthesis questions" in the pre-treatment lesson to ask relatively more questions of the same types in the post-treatment lessons. Since those three categories were dominant in contributing to "total questions", this finding might perhaps be most economically interpreted as showing a slight tendency to stability in the relative number of total questions asked. No such stability was apparent for any of the other sub-categories. The range of median correlations of all the coded behaviours with the criterion behaviours was from -0.05 to 0.08 with a mean of 0.02. When the behaviour "application questions" and associated behaviours "application probes" and "prompts" were disregarded because of their almost zero frequency of occurrence, the correlation of any pre-treatment behaviour with a criterion behaviour exceeded the value 0.3 on only eleven occasions. No consistent pattern of relationships was evident between behaviours.

The very low correlation between scores on the pre-treatment and post-treatment measures was repeated in the results of the Autumn semester. No correlation exceeded 0.2 when the criterion behaviour was related to the corresponding pre-treatment behaviour. As might be anticipated with the smaller number of students involved in the Autumn semester programme, the correlations of the full range of pre-treatment behaviours with post-treatment behaviours more

frequently exceeded 0.3. However, the range of median correlations was -0.05 to 0.09 with a mean of 0.01. Once again no pattern of relationships was discernible between the coded behaviours.

Over both semesters a very low correlation existed between pre-treatment and post-treatment scores, suggesting that the pre-treatment measure had little influence on the post-treatment measure.

No systematic procedure (such as using the corresponding pre-treatment measures as covariates for each criterion measure, or using the pre-treatment "total number of questions" measure as a covariate for all criterion measures) could be identified which would account for more than a negligible proportion of the variance in most criterion measures. Even if the several highest pre-treatment correlates of each criterion measure were to be automatically accepted as the covariates to be used in the analyses, the proportion of variance accounted for would still generally be small; and since the identity of those relatively highly correlated variables seemed to be largely a matter of chance, this policy would have made the interpretation of results extremely difficult. The proposed statistical analysis of covariance of criterion measures was therefore rejected. Instead, analyses of variance were completed on the post-treatment scores of the various treatment groups.

Spring semester 1972

Analyses of variance were used for a two factor experiment with, in addition, a simple control group. As well as testing for differences between the control group and the total experimental group, the analyses were applied across the individual experimental groups to test for main effects:

- the technical feedback variable (replay by audiotape or videotape)
- the inter-personal feedback variable (tutor present or absent),
- and the interaction effects between these variables.

A loss of subjects was noted over the duration of the experiment, and consequently cell numbers were unequal.

Following Winer (1971, p.468), the method of unweighted means was applied to include the case of unequal cell numbers. The computer programme written for the purpose of analyzing the experimental results is included in Appendix I.

No check for homogeneity of variance was conducted before administering the analysis of variance. Hays (1971) notes that

a test for homogeneity of variance before the analysis of variance has rather limited practical utility, and modern opinion holds that the analysis of variance can and should be carried on without a preliminary test of variances (p.381).

In order to confirm and illuminate the interpretation of the post-treatment results, a t-test was applied to the mean difference between pre-treatment and post-treatment results. In this way, an assessment was made of post-treatment lesson data against pre-treatment lesson data, and it was possible to be more confident regarding statements of teacher and pupil behavioural changes which might be attributable to the experimental treatments. The data samples were not independent but related, and the computational formula used

allowed for this (Lewis, 1972 p.121).

The criterion measures to be employed in assessing the hypotheses concerned with teacher questions and pupil responses have already been described in Chapter II (p.55). For each of the criterion measures, the results have been tabulated in three forms:

- (a) Part (a) of each table sets out the mean frequency of occurrence of the criterion behaviour for each treatment group both in the pre-treatment lesson and in the post-treatment lesson;
- (b) Part (b) of each table summarizes the analyses of variance of data derived from the post-treatment lesson. The full analysis of variance table for each criterion measure is included in Appendix K. Initially, the control group was compared to the sum of all the other treatment groups. Further, an analysis was made amongst the four treatment groups participating in practice teaching in the microteaching context. These analyses related to the two variants of technical feedback, the two variants of interpersonal feedback, and any interaction between these variants. Significance was noted when the variance ratio, F , exceeded the value necessary for significance at the 5 percent level.
- (c) Part (c) of each table set out the determined t-value for both the control group and, where the analyses of variance revealed no significant differences among them, the combination of the other treatment groups. The significance level of the t-value was noted at the 5, 2, and 1 percent levels.

RESULTS

(a) Teacher questioning behaviours

Tables 21, 22, 23, 24 and 25 set out the results for the criterion measures concerned with teacher questioning behaviours.

Table 21

Criterion Behaviour:

Total knowledge and lower order synthesis teacher questions

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
n = 42	No microteaching group control	23.43	23.76
n = 22	Microteaching groups Audiotape/tutor present	26.23	28.41
n = 20	Audiotape/tutor absent	30.15	20.55
n = 16	Videotape/tutor present	27.81	20.94
n = 21	Audiotape/tutor absent	20.71	19.14
n = 79	All microteaching groups	26.08	22.44

Table 21 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F value	P*
(i) Control vs all other groups	.25	n.s.
(ii) Tutor present/absent	1.67	n.s.
(iii) Audiotape/videotape	1.52	n.s.
(iv) Interaction (ii) and (iii)	.78	n.s.

* critical value $F_{.05}(1,116) = 3.92$ (Guilford, 1965, p.586)

(c) t-tests on Mean Difference between Pre-treatment and Post-treatment Scores

Treatment group	t-value	df	Significance level*
Control (no microteaching)	0.13	41	n.s.
All microteaching groups	1.68	78	n.s.

* critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
control group	41	2.02	2.42	2.70
other treatment groups	78	1.99	2.37	2.64

Table 22

Criterion Behaviour:

Total comprehension, application, analysis and synthesis
teacher questions

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
n = 42	No microteaching group control	10.67	17.57
n = 22	Microteaching groups Audiotape/tutor present	11.23	20.73
n = 20	Audiotape/tutor absent	10.05	20.75
n = 16	Videotape/tutor present	12.63	27.00
n = 21	Videotape/tutor absent	10.76	19.05
n = 79	All microteaching groups	11.09	21.88

Table 22 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F value	P*
(i) Control vs all other groups	5.58	<.05
(ii) Tutor present/absent	3.37	n.s.
(iii) Audiotape/videotape	1.12	n.s.
(iv) Interaction (ii) and (iii)	3.41	n.s.

*critical value $F_{.05}(1,116) = 3.92$ (Guilford, 1965, p.586)

(c) t-tests on Mean Difference between Pre-treatment and Post-treatment Scores

Treatment group	t-value	df	Significance level*
Control (no microteaching)	4.74	41	.01
All microteaching groups	8.05	78	.01

*critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
control group	41	2.02	2.42	2.70
other treatment groups	78	1.99	2.37	2.64

Table 23

Criterion Behaviour:

Total analysis and synthesis teacher questions

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
n = 42	No microteaching group control	3.00	6.02
n = 22	Microteaching groups Audiotape/tutor present	3.77	6.50
n = 20	Audiotape/tutor absent	2.75	8.35
n = 16	Videotape/tutor present	5.63	5.81
n = 21	Videotape/tutor absent	2.86	7.05
n = 79	All microteaching groups	3.75	6.93

Table 23 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F value	p*
(i) Control vs all other groups	0.55	n.s.
(ii) Tutor present/absent	1.13	n.s.
(iii) Audiotape/videotape	0.47	n.s.
(iv) Interaction (ii) and (iii)	0.05	n.s.

*critical value $F_{.05}(1,116) = 3.92$ (Guilford, 1965, p.586)

(c) t-tests on Mean Difference between Pre-treatment and Post-treatment Scores

Treatment group	t-value	df	Significance level*
Control (no microteaching)	3.14	41	.01
All microteaching groups	3.66	78	.01

*critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
control group	41	2.02	2.42	2.70
other treatment groups	78	1.99	2.37	2.64

Table 24

Criterion Behaviour:

Total analysis teacher questions

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
n = 42	No microteaching group control	2.40	4.12
n = 22	Microteaching groups Audiotape/tutor present	2.68	5.05
n = 20	Audiotape/tutor absent	2.15	5.25
n = 16	Videotape/tutor present	3.88	4.38
n = 21	Videotape/tutor absent	2.14	4.24
n = 79	All microteaching groups	2.71	4.73

Table 24 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F value	P*
(i) Control vs all other groups	0.44	n.s.
(ii) Tutor present/absent	0.00	n.s.
(iii) Audiotape/videotape	0.60	n.s.
(iv) Interaction (ii) and (iii)	0.03	n.s.

*critical value $F_{.05}(1,116) = 3.92$ (Guilford, 1965, p.586)

(c) t-tests on Mean Difference between Pre-treatment and Post-treatment Scores

Treatment group	t-value	df	Significance level*
Control (no microteaching)	1.97	41	n.s.
All microteaching groups	2.94	78	.01

*critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
control group	41	2.02	2.42	2.70
other treatment groups	78	1.99	2.37	2.64

Table 25

Criterion Behaviour:

Total synthesis teacher questions

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment Group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
n = 42	No microteaching group control	0.60	1.90
n = 22	Microteaching groups Audiotape/tutor present	0.92	1.45
n = 20	Audiotape/tutor absent	0.60	3.10
n = 16	Videotape/tutor present	1.75	1.44
n = 21	Audiotape/tutor absent	0.71	2.81
n = 79	All microteaching groups	1.00	2.20

Table 25 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F value	p*
(i) Control vs all other groups	0.21	n.s.
(ii) Tutor present/absent	3.86	n.s.
(iii) Audiotape/videotape	0.04	n.s.
(iv) Interaction (ii) and (iii)	0.03	n.s.

* critical value $F_{.05}(1,116) = 3.92$ (Guilford, 1965, p.586)

(c) t-tests on Mean Difference between Pre-treatment and Post-treatment Scores

Treatment group	t-value	df	Significance level*
Control (no microteaching)	2.55	41	.02
All microteaching groups	2.68	78	.01

*critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
control group	41	2.02	2.42	2.70
other treatment groups	78	1.99	2.37	2.64

A statistically significant difference between the control group and the microteaching groups was revealed for the combined categories of questioning behaviours, namely "comprehension, application, analysis and synthesis" category questions (Table 22, part (b)). However, there was no such significant difference for less broadly defined categories, and there were no significant differences among the microteaching groups for any of the variables.

Across the total experimental sample, the mean number of questions asked by the total experimental sample in the pre-treatment lesson was 32.43 and 36.99 for the post-treatment lesson. Those categories of questions described in the teaching programmes as lower order, that is "knowledge" and "lower order synthesis" category questions, accounted for 70 percent of the questions asked in the pre-treatment lesson, but in the post-treatment lesson the proportion of these questions was reduced to 50 percent (Tables 21, 22, part (a)). In both pre-treatment and post-treatment lessons, "comprehension" category questions made up approximately two-thirds of the remaining questions asked and the higher order categories of "analysis" and "synthesis" questions one-third (Tables 22, 23, part (a)). The mean frequency of occurrence of application category questions was 0.18 for both pre- and post-treatment lessons. This category was therefore eliminated from further consideration.

The results of all four groups involved in microteaching clearly tended towards the direction suggested by the teaching programme objectives. There was a substantial increase in the numbers of questions asked in the combined and individual categories of "comprehension," "analysis," and "synthesis" questions

(Tables 22-25, part (a)). Further, in each of the categories, the difference between means of the pre- and post-treatment results was significant at the .01 level (Tables 22-25, part (c)). At the same time, although a slight decrease was evident in the numbers of "knowledge" or "lower order synthesis" category questions asked, this did not represent a significant difference between the pre- and post-treatment results (Table 21, parts (a), (c)).

The control group profile was quite similar in that its results also followed the anticipated programme outcomes. The t-tests indicated significant differences between pre- and post-treatment scores for the behaviours "comprehension", "analysis", "synthesis" questions when combined as well as for the combination of "analysis and synthesis" questions, whilst being not significant for the combination of lower order questions, "knowledge" and "lower order synthesis" (Tables 21-23, part (c)). It should be noted that the difference between means for control group teachers asking "analysis" questions failed to prove significant, and that the lower level of significance of the difference between means was weaker than the microteaching groups for the category "synthesis" questions (Tables 24, 25 part (c)).

(b) Pupil response behaviours

Results for the criterion measures concerned with pupil response behaviours are summarized in Tables 26 to 31.

Table 26

Criterion Behaviour:

Total "original" pupil responses

(a) Frequency of Occurrence of Behaviour by Treatment Group

	Treatment group	Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
n = 42	No microteaching group control	2.52	4.43
n = 22	Microteaching groups Audiotape/tutor present	2.75	4.64
n = 20	Audiotape/tutor absent	2.15	6.70
n = 16	Videotape/tutor present	3.44	4.44
n = 21	Audiotape/tutor absent	2.24	4.67
n = 79	All microteaching groups	2.65	5.11

Table 26 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F value	p*
(i) Control vs all other groups	0.51	n.s.
(ii) Tutor present/absent	1.03	n.s.
(iii) Audiotape/videotape	0.98	n.s.
(iv) Interaction (ii) and (iii)	0.66	n.s.

*critical value $F_{.05}(1,116) = 3.92$ (Guilford, 1965, p.586)

(c) t-tests on Mean Difference between Pre-treatment and Post-treatment Scores

Treatment group	t-value	df	Significance level*
Control (no microteaching)	3.35	41	.01
All microteaching groups	2.87	78	.01

*critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
control group	41	2.02	2.42	2.70
other treatment groups	78	1.99	2.37	2.64

Table 27

Criterion Behaviour:

Total pupil responses "supported"

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
n = 42	No microteaching group control	6.36	8.33
n = 22	microteaching groups Audiotape/tutor present	6.45	10.14
n = 20	Audiotape/tutor absent	4.75	8.55
n = 16	Videotape/tutor present	8.06	11.31
n = 21	Audiotape/tutor absent	4.90	9.67
n = 79	All microteaching groups	6.04	9.92

Table 27 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F value	P*
(i) Control vs all other groups	0.96	n.s.
(ii) Tutor present/absent	0.72	n.s.
(iii) Audiotape/videotape	0.36	n.s.
(iv) Interaction (ii) and (iii)	0.00	n.s.

*critical value $F_{.05}(1,116) = 3.92$ (Guilford, 1965, p.586)

(c) t-tests on Mean Difference between Pre-treatment and Post-treatment Scores

Treatment group	t-value	df	Significance level
Control (no microteaching)	1.64	41	n.s.
All microteaching groups	3.26	78	.01

*critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
control group	41	2.02	2.42	2.70
other treatment groups	78	1.99	2.37	2.64

Table 28

Criterion Behaviour:

Total pupil responses "original" and "supported"

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
n = 42	No microteaching group control	1.24	2.71
n = 22	Microteaching groups Audiotape/tutor present	1.73	2.86
n = 20	Audiotape/tutor absent	1.05	3.30
n = 16	Videotape/tutor present	1.75	2.88
n = 21	Audiotape/tutor absent	1.00	2.48
n = 79	All microteaching groups	1.38	2.88

Table 28 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F value	p*
(i) Control vs all other groups	0.06	n.s.
(ii) Tutor present/absent	0.00	n.s.
(iii) Audiotape/videotape	0.27	n.s.
(iv) Interaction (ii) and (iii)	0.28	n.s.

*critical value $F_{.05}(1,116) = 3.92$ (Guilford, 1965, p.586)

(c) t-tests on Mean Difference between Pre-treatment and Post-treatment Scores

Treatment group	t-value	df	Significance level*
Control (no microteaching)	3.28	41	.01
All microteaching groups	3.25	78	.01

*critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
control group	41	2.02	2.42	2.70
other treatment groups	78	1.99	2.37	2.64

Table 29.

Criterion Behaviour:

Total analysis and synthesis questions followed by "original" pupil response

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
n = 42	No microteaching group control	0.24	0.64
n = 22	Microteaching groups Audiotape/tutor present	0.23	0.91
n = 20	Audiotape/tutor absent	0.15	1.85
n = 16	Videotape/tutor present	1.13	0.56
n = 21	Audiotape/tutor absent	0.33	1.10
n = 79	All microteaching groups	0.46	1.10

Table 29 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F value	p*
(i) Control vs all other groups	2.04	n.s.
(ii) Tutor present/absent	3.71	n.s.
(iii) Audiotape/videotape	2.08	n.s.
(iv) Interaction (ii) and (iii)	0.29	n.s.

*critical value $F_{.05}(1,116) = 3.92$ (Guilford, 1965, p.586)

(c) t-tests on Mean Difference between Pre-treatment and Post-treatment Scores

Treatment group	t-value	df	Significance level*
Control (no microteaching)	2.58	41	.02
All microteaching groups	2.59	78	.02

*critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
control group	41	2.02	2.42	2.70
other treatment groups	78	1.99	2.37	2.64

Table 30

Criterion Behaviour:

Total analysis and synthesis questions followed by a pupil response "supported"

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
n = 42	No microteaching group control	1.86	2.86
n = 22	Microteaching groups Audiotape/tutor present	1.82	3.55
n = 20	Audiotape/tutor absent	1.05	4.25
n = 16	Videotape/tutor present	2.75	4.12
n = 21	Audiotape/tutor absent	0.95	3.57
n = 79	All microteaching groups	1.64	3.87

Table 30 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F value	P*
(i) Control vs all other groups	1.47	n.s.
(ii) Tutor present/absent	0.01	n.s.
(iii) Audiotape/videotape	0.00	n.s.
(iv) Interaction (ii) and (iii)	0.40	n.s.

*critical value $F_{.05}(1,116) = 3.92$ (Guilford, 1965, p.586)

(c) t-tests on Mean Difference between Pre-treatment and Post-treatment Scores

Treatment group	t-value	df	Significance level*
Control (no microteaching)	1.32	41	n.s.
All microteaching groups	3.96	78	.01

*critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
control group	41	2.02	2.42	2.70
other treatment groups	78	1.99	2.37	2.64

Table 31

Criterion Behaviour:

Total analysis and synthesis questions followed by "original" and "supported" pupil responses

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
n = 42	No microteaching group control	0.48	1.48
n = 22	Microteaching groups Audiotape/tutor present	0.73	1.55
n = 20	Audiotape/tutor absent	0.80	2.50
n = 16	Videotape/tutor present	1.00	1.69
n = 21	Audiotape/tutor absent	0.19	1.57
n = 79	All microteaching groups	0.68	1.83

Table 31 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F value	P*
(i) Control vs all other groups	0.55	n.s.
(ii) Tutor present/absent	0.56	n.s.
(iii) Audiotape/videotape	0.49	n.s.
(iv) Interaction (ii) and (iii)	0.92	n.s.

*critical value $F_{.05} (1,116) = 3.92$ (Guilford, 1965, p.586)

(c) t-tests on Mean Difference between Pre-treatment and Post-treatment Scores

Treatment group	t-value	df	Significance level*
Control (no microteaching)	3.10	41	.01
All microteaching groups	3.81	78	.01

*critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.02	.02	.01
control group	41	2.02	2.42	2.70
other treatment groups	78	1.99	2.37	2.64

The statistical analysis of post-treatment results for the pupil response behaviours failed to reveal any significant difference between the control group and the four groups including microteaching in their programme (Tables 26- 31, part (b)). Within the microteaching groups no significant difference resulted from the main treatment effects or the interaction of the feedback treatments.

Apart from two exceptions, both involving the control group and "supported" pupil responses to teacher questions (Tables 27, 30; part (c)), the differences between pre- and post-treatment means for these behaviours were significant (Tables 26- 31, part (c)). In all cases in which significance was achieved, the difference followed the direction suggested by the objectives of the teaching programme.

The level of significance of the difference between means of the pre- and post-treatment results was weaker (.02), for both control and the other experimental groups for "original" pupil responses following a teacher analysis or synthesis category question, than for such responses in general (Table 29, part (c)). However, the differences in other pupil response behaviours when following higher order questions were comparable with differences in those same behaviours overall (Tables 26- 31, part (c)).

c) Follow-up behaviours subsequent to the asking of an initial question or response to such a question

For these behaviours, the summary of data is presented in Tables 32 to 36.

Table 32

Criterion Behaviour:

Total occasions "no opportunity given to pupils to respond" to a teacher question

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
n = 42	No microteaching group control	2.36	3.02
n = 22	Microteaching groups Audiotape/tutor present	2.55	3.23
n = 20	Audiotape/tutor absent	2.50	2.85
n = 16	videotape/tutor present	4.06	4.06
n = 21	Audiotape/tutor absent	2.76	4.48
n = 79	All microteaching groups	2.97	3.65

Table 32 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F value	p*
(i) Control vs all other groups	1.13	n.s.
(ii) Tutor present/absent	0.00	n.s.
(iii) Audiotape/videotape	3.07	n.s.
(iv) Interaction (ii) and (iii)	0.32	n.s.

*critical value $F_{.05}(1,116) = 3.92$ (Guilford, 1965, p.586)

(c) t-tests on Mean Difference between Pre-treatment and Post-treatment Scores

Treatment group	t-value	df	Significance level*
Control (no microteaching)	1.20	41	n.s.
All microteaching groups	1.41	78	n.s.

*critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
control group	41	2.02	2.42	2.70
other treatment groups	78	1.99	2.37	2.64

Table 33

Criterion Behaviour:

Total occasions "no pupil response offered" to a teacher question

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
n = 42	No microteaching group control	6.07	7.43
n = 22	Microteaching groups Audiotape/tutor present	9.18	7.77
n = 20	Audiotape/tutor absent	6.45	7.20
n = 16	Videotape/tutor present	5.44	7.50
n = 21	Audiotape/tutor absent	7.00	6.95
n = 79	All microteaching groups	7.02	7.36

Table 33 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F value	P*
(i) Control vs all other groups	0.00	n.s.
(ii) Tutor present/absent	0.17	n.s.
(iii) Audiotape/videotape	0.04	n.s.
(iv) Interaction (ii) and (iii)	0.00	n.s.

*critical value $F_{.05}(1,116) = 3.92$ (Guilford, 1965, p.586)

(c) t-tests on Mean Difference between Pre-treatment and Post-treatment Scores

Treatment group	t-value	df	Significance level*
Control (no microteaching)	1.16	41	n.s.
All microteaching groups	0.38	78	n.s.

*critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
control group	41	2.02	2.42	2.70
other treatment groups	78	1.99	2.37	2.64

Table 34

Criterion Behaviour:

Total teacher prompts

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment Group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
n = 42	No microteaching group control	1.48	3.17
n = 22	Microteaching groups Audiotape/tutor present	2.59	2.95
n = 20	Audiotape/tutor absent	2.48	3.45
n = 16	Videotape/tutor present	1.44	3.69
n = 21	Audiotape/tutor absent	1.67	2.29
n = 79	All microteaching groups	2.05	3.09

Table 34 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F value	p*
(i) Control vs all other groups	0.01	n.s.
(ii) Tutor present/absent	0.37	n.s.
(iii) Audiotape/videotape	0.08	n.s.
(iv) Interaction (ii) and (iii)	1.61	n.s.

*critical value $F_{.05}(1,116) = 3.92$ (Guilford, 1965, p.586)

(c) t-tests on Mean Difference between Pre-treatment and Post-treatment Scores

Treatment group	t-value	df	Significance level*
Control (no microteaching)	2.60	41	.02
All microteaching groups	2.53	78	.02

*critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
control group	41	2.02	2.42	2.70
other treatment groups	78	1.99	2.37	2.64

Table 35

Criterion Behaviour:

Total teacher probes

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
n = 42	No microteaching group control	1.45	2.79
n = 22	Microteaching groups Audiotape/tutor present	1.64	3.32
n = 20	Audiotape/tutor absent	1.50	4.35
n = 16	Videotape/tutor present	2.81	4.44
n = 21	Audiotape/tutor absent	1.62	2.81
n = 79	All microteaching groups	1.89	3.73

Table 35 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F value	P*
(i) Control vs all other groups	1.64	n.s.
(ii) Tutor present/absent	0.12	n.s.
(iii) Audiotape/videotape	0.06	n.s.
(iv) Interaction (ii) and (iii)	2.33	n.s.

*critical value $F_{.05}(1,116) = 3.92$ (Guilford, 1965, p.586)

(c) t-tests on Mean Difference between Pre-treatment and Post-treatment Scores

Treatment group	t-value	df	Significance level*
Control (no microteaching)	2.38	41	.05
All microteaching groups	3.89	78	.01

*critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
control group	41	2.02	2.42	2.70
other treatment groups	78	1.99	2.37	2.64

Table 36

Criterion Behaviour:

Analysis plus synthesis category teacher probes

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
n = 42	No microteaching group control	.55	1.55
n = 22	Microteaching groups Audiotape/tutor present	.77	1.82
n = 20	Audiotape/tutor absent	.70	2.50
n = 16	Videotape/tutor present	1.50	1.81
n = 21	Audiotape/tutor absent	.57	1.67
n = 79	All microteaching groups	.85	1.95

Table 36 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F value	p*
(i) Control vs all other groups	0.65	n.s.
(ii) Tutor present/absent	0.21	n.s.
(iii) Audiotape/videotape	0.51	n.s.
(iv) Interaction (ii) and (iii)	0.49	n.s.

*critical value $F_{.05}(1,116) = 3.92$ (Guilford, 1965, p.586)

(c) t-tests on Mean Difference between Pre-treatment and Post-treatment Scores

Treatment group	t-value	df	Significance level*
Control (no microteaching)	2.38	41	.05
All microteaching groups	3.30	78	.01

*critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
control group	41	2.02	2.42	2.70
other treatment groups	78	1.99	2.37	2.64

These results followed the pattern already established in that no significant difference was found between post-treatment behaviour in control group lessons and lessons taught by the microteaching groups (Tables 32 - 36, part (b)).

For two of the behaviours, "no opportunity given to pupils to respond to a teacher question" and "no pupil response offered to a teacher question", it would be consistent with the programme objectives if decreases had been recorded between pre- and post-treatment lessons in the frequency of occurrence of these behaviours (Tables 32, 33; part (b)). The t-values for differences between means were not significant for either behaviour for any treatment group (Tables 32, 33; part (c)). The occurrence of these behaviours was comparable across all treatment groups and between pre- and post-treatment lessons (Tables 32, 33; part (a)).

Some compensation for this situation might be found in that the number of occasions in which a teacher followed up the absence of a pupil response by offering a "prompt" did increase significantly between pre- and post-treatment lessons (Table 34, parts (a), (b)). Such a result was consistent with programme objectives.

There were also significant increases, in accordance with programme objectives, in the number of "probes" used by both the control group and the microteaching groups, and in the number of "probes" at the higher cognitive levels. For both these variables, the increases for the microteaching groups were at a higher level of significance than those for the control group.

Testing of Hypotheses

A detailed statement of these hypotheses has been given in Chapter I (p.39).

Hypothesis 1 related to the provision of two forms of technical feedback to student teachers following their practice teaching in the microteaching format.

For the teacher and pupil behaviours, there were no statistically significant differences ($P \leq .05$) between the treatment groups provided with an audiotape replay of their teaching and those provided with videotape. Further, no pattern of relationships or trend appeared evident over the ranges of behaviours which might be attributable to either variant of technical feedback.

Hypothesis 1 was therefore not rejected for any of the specified sets of behaviours.

Hypothesis 2 centred around the provision of staff tutor support to student teachers during replay sessions of their microteaching experiences.

As for hypothesis 1, for the specified ranges of teacher and pupil behaviours, no significant differences were found ($P \leq .05$) between those treatment groups whose practice teaching was supervised by a staff tutor and those who did not receive staff tutor support.

In those terms, hypothesis 2 was not rejected.

Hypothesis 3. No treatment interaction produced a statistically significant result ($P \leq .05$) and therefore this hypothesis was not rejected.

Hypothesis 4. Over the 16 specified teacher and pupil behaviours, a statistically significant difference ($P < .05$) between those groups participating in microteaching experiences and that group not involved in microteaching was found for only one questioning behaviour. This behaviour was the combined category of "comprehension, analysis, and synthesis" teacher questions.

Considering each of the criterion variables independently, hypothesis 4 would be rejected in relation to this one variable. Since, however, the questioning variables were not in fact independent, and since the overall pattern of results did not reveal any clearly contrasting trends for different variables, it might more generally be concluded that, although there was a slight and fairly consistent tendency for the microteaching practice groups to perform better in relation to the programme objectives than the control group, this tendency was not sufficiently strong to justify a rejection of the hypothesis.

Autumn Semester 1972

A three factor analysis of variance was used to analyze the data derived from the post-treatment lessons. As well as making an assessment of the influence on performance of the two teaching programmes (Stirling/Alternative) and the other main effects of technical feedback (replay by audiotape/videotape) and inter-personal feedback (supervision by a staff tutor/no staff tutor supervision), the analysis also examined interactions between each two of these variables and among all three of them.

The analysis follows the technique outlined by Veldman (1967, p.257) using a computer programme written for the purpose (see Appendix J).

As for the Spring semester results, the data was summarized and is presented for each criterion measure in three forms:

- (a) a table setting out the mean frequency of occurrence of the criterion behaviour in the pre- and post-treatment lessons. The data is presented for the four experimental groups within each of the teaching programmes and for the three main effects groups.
- (b) a summary table of the analysis of variance of main effects and interactions. Significance is noted at the five percent level. The full analysis of variance table for each criterion measure is included in Appendix L.
- (c) to confirm the interpretation of the post-treatment results, a t-test of significance between means of the pre- and post-treatment lesson data was carried out on the results for the two teaching programme groups. Where the application of an analysis of variance indicated that a treatment interaction group should be treated as belonging to different populations, then these sub-groups were differentiated in the comparison made

between pre- and post-treatment performance.

RESULTS

(a) Teacher questioning behaviours

Tables 37 to 41 which follow set down the result summaries for this group of criterion behaviours.

Table 37

Criterion Behaviour:

Total knowledge and lower order synthesis teacher questions

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
(n = 8)	Stirling programme: Audiotape/tutor present	36.13	16.63
(n = 8)	Audiotape/tutor absent	37.38	24.63
(n = 8)	Videotape/tutor present	29.75	29.75
(n = 7)	Videotape/tutor absent	33.57	18.86
Alternative programme:			
(n = 8)	Audiotape/tutor present	40.00	20.50
(n = 7)	Audiotape/tutor absent	41.29	22.00
(n = 8)	Videotape/tutor present	40.50	15.13
(n = 7)	Videotape/tutor absent	29.14	15.43
(n = 31)	Stirling programme	34.20	22.47
(n = 30)	Alternative programme	37.73	18.27
(n = 32)	Tutor present	36.60	20.50
(n = 29)	Tutor absent	35.35	20.23
(n = 31)	Replay by audiotape	38.70	20.94
(n = 30)	Replay by videotape	33.24	19.79

Table 37 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F _{ratio}	P*
(i) Programme Stirling/ Alternative	1.78	n.s.
(ii) Technical feedback Audiotape/videotape	.07	n.s.
(iii) Interpersonal feedback Tutor present/absent	.07	n.s.
(iv) Interactions		
(i) and (ii)	2.30	n.s.
(i) and (iii)	.00	n.s.
(ii) and (iii)	1.32	n.s.
(i) and (ii) and (iii)	.94	n.s.

* critical value $F_{.05}(1,53) = 4.02$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Pre-treatment and Post-treatment Scores for Treatment Groups

Treatment group	t-value	df	Significance level *
stirling programme	2.98	30	.01
Alternative programme	3.40	29	.01

* critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
Stirling programme	30	2.04	2.46	2.75
Alternative programme	29	2.05	2.46	2.76

Table 38

Criterion Behaviour:

Total comprehension, application, analysis, and synthesis
teacher questions

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
(n = 8)	Stirling programme: Audiotape/tutor present	11.00	23.88
(n = 8)	Audiotape/tutor absent	9.63	18.63
(n = 8)	Videotape/tutor present	15.75	21.75
(n = 7)	Videotape/tutor absent	8.71	24.14
Alternative programme:			
(n = 8)	Audiotape/tutor present	12.75	25.75
(n = 7)	Audiotape/tutor absent	8.14	29.29
(n = 8)	Videotape/tutor present	12.13	30.13
(n = 7)	Videotape/tutor absent	15.00	28.57
(n = 31)	Stirling programme	11.27	22.10
(n = 30)	Alternative programme	12.01	28.43
(n = 32)	Tutor present	12.91	25.38
(n = 29)	Tutor absent	10.37	25.16
(n = 31)	Replay by audiotape	10.38	24.39
(n = 30)	Replay by videotape	12.90	26.15

Table 38 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F ratio	p*
(i) Programme Stirling/ Alternative	6.97	<.05
(ii) Technical feedback Audiotape/videotape	.54	n.s.
(iii) Interpersonal feedback Tutor present/absent	.01	n.s.
(iv) Interactions		
(i) and (ii)	.00	n.s.
(i) and (iii)	.25	n.s.
(ii) and (iii)	.07	n.s.
(i) and (ii) and (iii)	1.76	n.s.

* critical value $F_{.05}(1,53) = 4.02$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Pre-treatment and Post-treatment Scores for Treatment Groups

Treatment group	t-value	df	Significance level *
Stirling programme	4.08	30	.01
Alternative programme	7.73	29	.01

* critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
Stirling programme	30	2.04	2.46	2.75
Alternative programme	29	2.05	2.46	2.76

Criterion Behaviour:

Total analysis and synthesis teacher questions

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
(n = 8)	Stirling programme: Audiotape/tutor present	3.38	8.63
(n = 8)	Audiotape/tutor absent	5.38	7.25
(n = 8)	Videotape/tutor present	2.50	8.50
(n = 7)	Videotape/tutor absent	3.29	5.86
Alternative programme:			
(n = 8)	Audiotape/tutor present	3.25	10.25
(n = 7)	Audiotape/tutor absent	4.00	12.71
(n = 8)	Videotape/tutor present	4.63	13.75
(n = 7)	Videotape/tutor absent	3.86	16.57
(n = 31)	Stirling programme	3.65	7.56
(n = 30)	Alternative programme	4.03	13.32
(n = 32)	Tutor present	3.44	10.28
(n = 29)	Tutor absent	4.13	10.60
(n = 31)	Replay by audiotape	4.00	9.71
(n = 30)	Replay by videotape	3.57	11.17

Table 39 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F ratio	p*
(i) Programme Stirling/ Alternative	14.37	<.01
(ii) Technical feedback Audiotape/videotape	.92	n.s.
(iii) Interpersonal feedback Tutor present/absent	.04	n.s.
(iv) Interactions		
(i) and (ii)	2.13	n.s.
(i) and (iii)	2.34	n.s.
(ii) and (iii)	.02	n.s.
(i) and (ii) and (iii)	.07	n.s.

* critical value $F_{.05}(1,53) = 4.02$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Pre-treatment and Post-treatment Scores for Treatment Groups

Treatment group	t-value	df	Significance level *
Stirling programme	2.91	30	.01
Alternative programme	11.27	29	.01

* critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
Stirling programme	30	2.04	2.46	2.75
Alternative programme	29	2.05	2.46	2.76

Table 40

Criterion Behaviour:

Total analysis teacher questions

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
(n = 8)	Stirling programme: Audiotape/tutor present	2.75	7.50
(n = 8)	Audiotape/tutor absent	4.25	6.38
(n = 8)	Videotape/tutor present	2.50	5.38
(n = 7)	Videotape/tutor absent	2.29	5.57
	Alternative programme:		
(n = 8)	Audiotape/tutor present	2.00	8.25
(n = 7)	Audiotape/tutor absent	3.14	10.71
(n = 8)	Videotape/tutor present	3.63	10.38
(n = 7)	Videotape/tutor absent	3.00	11.71
(n = 31)	Stirling programme	2.95	6.21
(n = 30)	Alternative programme	2.94	10.26
(n = 32)	Tutor present	3.72	7.88
(n = 29)	Tutor absent	3.17	8.59
(n = 31)	Replay by audiotape	3.04	8.21
(n = 30)	Replay by videotape	2.86	8.26

Table 40 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F ratio	p*
(i) Programme Stirling/ Alternative	8.87	<.01
(ii) Technical feedback Audiotape/videotape	.00	n.s.
(iii) Interpersonal feedback Tutor present/absent	.28	n.s.
(iv) Interactions		
(i) and (ii)	1.23	n.s.
(i) and (iii)	.75	n.s.
(ii) and (iii)	.00	n.s.
(i) and (ii) and (iii)	.20	n.s.

* critical value $F_{.05}(1,53) = 4.02$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Pre-treatment and Post-treatment Scores for Treatment Groups

Treatment group	t-value	df	Significance level *
stirling programme	2.86	30	.01
Alternative programme	5.19	29	.01

* critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
Stirling programme	30	2.04	2.46	2.75
Alternative programme	29	2.05	2.46	2.76

Table 41

Criterion Behaviour:

Total synthesis teacher questions

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
(n = 8)	Stirling programme: Audiotape/tutor present	0.63	1.13
(n = 8)	Audiotape/tutor absent	1.13	0.88
(n = 8)	Videotape/tutor present	0.00	3.13
(n = 7)	Videotape/tutor absent	0.88	0.29
Alternative programme:			
(n = 8)	Audiotape/tutor present	0.50	2.00
(n = 7)	Audiotape/tutor absent	1.29	2.00
(n = 8)	Videotape/tutor present	1.00	3.38
(n = 7)	Videotape/tutor absent	0.86	4.86
(n = 31)	Stirling programme	0.66	1.35
(n = 30)	Alternative programme	0.91	3.06
(n = 32)	Tutor present	0.53	2.41
(n = 29)	Tutor absent	1.04	2.00
(n = 31)	Replay by audiotape	0.89	1.50
(n = 30)	Replay by videotape	0.69	2.91

Table 41 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F ratio	p*
(i) Programme Stirling/ Alternative	5.19	<.05
(ii) Technical feedback Audiotape/videotape	3.55	n.s.
(iii) Interpersonal feedback Tutor present/absent	.29	n.s.
(iv) Interactions		
(i) and (ii)	.89	n.s.
(i) and (iii)	2.33	n.s.
(ii) and (iii)	.14	n.s.
(i) and (ii) and (iii)	1.85	n.s.

* critical value $F_{.05}(1,53) = 4.02$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Pre-treatment and Post-treatment Scores for Treatment Groups

Treatment group	t-value	df	Significance level *
stirling programme	1.21	30	n.s.
Alternative programme	3.91	29	.01

* critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
Stirling programme	30	2.04	2.46	2.75
Alternative programme	29	2.05	2.46	2.76

Whilst the analysis of post-treatment measures indicated a significant difference ($P \leq .05$) on all the criterion measures of teacher questioning behaviours in favour of the Alternative programme group, no result was significant for the other main effects or for any of the several interactions between treatment variants (Tables 37-41,(b)).

Inspection of the tables of mean frequencies of occurrence of the range of teacher questioning behaviours revealed differences between the results of treatment sub-groups, but no particular pattern of results was apparent across several of the questioning behaviours. In view of the lack of statistical significance of the results, it would have been unwise to interpret these differences as being resultant from the experimental treatment (Tables 37-41, (a)).

The nature of the range of questions asked in the pre-treatment lessons was similar across both teaching programmes. The mean frequency of total questions asked was 43.00. Approximately 75 percent of those questions were in the lower order categories of "knowledge" and "lower order synthesis", with 25 percent of questions in the other categories (Tables 37,38,(a)).

Of the latter 25 percent, approximately two-thirds of the questions were coded as "comprehension", "analysis" and "synthesis" questions accounting for the remainder (Tables 38,39 (a)). The category "asking application questions" was again excluded from further discussion as an individual category of questioning behaviour as the mean frequency of occurrence of this behaviour in the post-treatment lesson was 0.13.

As might be expected from the analysis, divergent patterns of questioning behaviour were evident in the post-treatment results

for the two teaching programmes. The mean frequency of all questions asked for the total experimental sample decreased to 39.15. For the Stirling programme group, approximately 50 percent of the questions asked in the post-treatment lesson are "knowledge" and "lower order synthesis". Of the remaining 50 percent the proportion of questions coded as "comprehension", "analysis" and "synthesis" followed the pattern set in the pre-treatment lesson, i.e. two-thirds "comprehension" and one-third "analysis/synthesis." By contrast, only 40 percent of the questions asked by the Alternative programme group fell into the "knowledge" and "lower order synthesis" categories. The remaining 60 percent of questions were almost equally divided between the "comprehension" category and the two higher order categories "analysis/synthesis" (Tables 37-39, (a)).

In both programmes, the changes between pre- and post-treatment lessons in the balance of different question types asked were consistent with programme objectives. An increase in the frequency of the higher order categories was directly stated as a desirable outcome. Whilst not directly stated, yet it was also consistent with these objectives that a reduction occurred in the frequency of lower order questions asked.

With one exception, significant ($P \leq .01$) t-values were obtained for both the Stirling programme group and the Alternative programme group on all questioning behaviours, indicating the extent of difference between the means of pre- and post-treatment results (Tables 37-41, (a)).

The Stirling programme group result for the behaviour "asking synthesis questions" was not significant (Table 41, (c)) although, consistent with the results for all other questioning behaviours,

this post-treatment result tended in the direction desired by the objectives of the teaching programme.

For every nominated questioning behaviour, the t-value calculated for the Alternative programme group was higher than that for the Stirling programme group, indicating that the achievements of the Alternative group exceeded those of the Stirling programme group.

(b) Pupil response behaviours

The data for these behaviours is summarized in Tables 42-47.

Performance in these behaviours followed the pattern established with the range of teacher questioning behaviours.

Table 42

Criterion Behaviour:

Total "original" pupil responses

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
(n = 8)	Stirling programme: Audiotape/tutor present	2.00	6.63
(n = 8)	Audiotape/tutor absent	4.25	4.50
(n = 8)	Videotape/tutor present	2.00	5.38
(n = 7)	Videotape/tutor absent	1.43	2.71
Alternative programme:			
(n = 8)	Audiotape/tutor present	4.25	5.88
(n = 7)	Audiotape/tutor absent	3.57	7.29
(n = 8)	Videotape/tutor present	3.38	8.75
(n = 7)	Videotape/tutor absent	3.86	9.29
(n = 31)	Stirling programme	2.42	4.81
(n = 30)	Alternative programme	3.77	7.80
(n = 32)	Tutor present	2.91	6.66
(n = 29)	Tutor absent	3.28	5.95
(n = 31)	Replay by audiotape	3.52	6.07
(n = 30)	Replay by videotape	2.67	6.53

Table 42 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F ratio	p*
(i) Programme Stirling/ Alternative	5.81	<.05
(ii) Technical feedback Audiotape/videotape	.14	n.s.
(iii) Interpersonal feedback Tutor present/absent	.33	n.s.
(iv) Interactions		
(i) and (ii)	2.53	n.s.
(i) and (iii)	1.84	n.s.
(ii) and (iii)	.08	n.s.
(i) and (ii) and (iii)	.00	n.s.

* critical value $F_{.05}(1,53) = 4.02$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Pre-treatment and Post-treatment Scores for Treatment Groups

Treatment group	t-value	df	Significance level *
Stirling programme	1.34	30	n.s.
Alternative programme	2.99	29	.01

* critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
Stirling programme	30	2.04	2.46	2.75
Alternative programme	29	2.05	2.46	2.76

Table 43

Criterion Behaviour:

Total pupil responses "supported"

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
(n = 8)	Stirling programme: Audiotape/tutor present	6.13	9.63
(n = 8)	Audiotape/tutor absent	12.00	11.63
(n = 8)	Videotape/tutor present	9.63	12.88
(n = 7)	Videotape/tutor absent	5.71	7.00
Alternative programme:			
(n = 8)	Audiotape/tutor present	14.38	10.00
(n = 7)	Audiotape/tutor absent	9.43	12.71
(n = 8)	Videotape/tutor present	13.75	11.50
(n = 7)	Videotape/tutor absent	9.00	17.71
(n = 31)	Stirling programme	8.37	10.28
(n = 30)	Alternative programme	11.64	12.98
(n = 32)	Tutor present	10.97	11.00
(n = 29)	Tutor absent	9.04	12.26
(n = 31)	Replay by audiotape	10.49	10.99
(n = 30)	Replay by videotape	9.53	12.27

Table 43 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F ratio	P*
(i) Programme Stirling/ Alternative	4.02	<.05
(ii) Technical feedback Audiotape/videotape	.90	n.s.
(iii) Interpersonal feedback Tutor present/absent	.87	n.s.
(iv) Interactions		
(i) and (ii)	2.11	n.s.
(i) and (iii)	5.59	.05
(ii) and (iii)	.65	n.s.
(i) and (ii) and (iii)	4.01	n.s.

* critical value $F_{.05}(1,53) = 4.02$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Pre-treatment and Post-treatment Scores for Treatment Groups

Treatment group	t-value	df	Significance level*
Stirling programme/tutor present	1.99	15	n.s.
tutor absent	0.43	14	n.s.
Alternative programme/ tutor present	0.84	15	n.s.
tutor absent	2.86	13	.02

* critical t-values (Winer, 1971, p.863)

df	Significance level		
	.05	.02	.01
13	2.16	2.65	3.01
14	2.14	2.62	2.98
15	2.13	2.60	2.95

Table 44

Criterion Behaviour:

Total pupil responses "original" and "supported"

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
(n = 8)	Stirling programme: Audiotape/tutor present	0.75	3.75
(n = 8)	Audiotape/tutor absent	2.25	2.25
(n = 8)	Videotape/tutor present	0.38	2.50
(n = 7)	Videotape/tutor absent	0.86	1.29
Alternative programme:			
(n = 8)	Audiotape/tutor present	1.50	3.25
(n = 7)	Audiotape/tutor absent	1.00	3.29
(n = 8)	Videotape/tutor present	2.63	2.75
(n = 7)	Videotape/tutor absent	1.29	6.14
(n = 31)	Stirling programme	1.06	2.45
(n = 30)	Alternative programme	1.61	3.88
(n = 32)	Tutor present	1.32	3.06
(n = 29)	Tutor absent	1.35	3.24
(n = 31)	Replay by audiotape	1.38	3.13
(n = 30)	Replay by videotape	1.29	3.17

Table 44 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F ratio	P*
(i) Programme Stirling/ Alternative	4.48	<.05
(ii) Technical feedback Audiotape/videotape	.00	n.s.
(iii) Interpersonal feedback Tutor present/absent	.07	n.s.
(iv) Interactions		
(i) and (ii)	2.94	n.s.
(i) and (iii)	5.31	<.05
(ii) and (iii)	1.87	n.s.
(i) and (ii) and (iii)	1.33	n.s.

* critical value $F_{.05}(1,53) = 4.02$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Pre-treatment and Post-treatment Scores for Treatment Groups

Treatment group	t-value	df	Significance level*
Stirling programme/tutor present	3.51	15	.01
tutor absent	.39	14	n.s.
Alternative programme/ tutor present	.78	15	n.s.
tutor absent	5.48	13	.01

* critical t-values (Winer, 1971, p.863)

df	Significance level		
	.05	.02	.01
13	2.16	2.65	3.01
14	2.14	2.62	2.98
15	2.13	2.60	2.95

Table 45

Criterion Behaviour:

Total analysis and synthesis questions followed by an "original" pupil response

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
(n = 8)	Stirling programme: Audiotape/tutor present	1.00	1.25
(n = 8)	Audiotape/tutor absent	0.50	1.25
(n = 8)	Videotape/tutor present	0.25	1.88
(n = 7)	Videotape/tutor absent	0.14	0.71
	Alternative programme:		
(n = 8)	Audiotape/tutor present	0.88	2.38
(n = 7)	Audiotape/tutor absent	0.43	1.57
(n = 8)	Videotape/tutor present	0.38	5.00
(n = 7)	Videotape/tutor absent	0.71	1.86
(n = 31)	Stirling programme	0.47	1.27
(n = 30)	Alternative programme	0.60	2.70
(n = 32)	Tutor present	0.63	2.63
(n = 29)	Tutor absent	0.45	1.35
(n = 31)	Replay by audiotape	0.70	1.61
(n = 30)	Replay by videotape	0.37	2.36

Table 45 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F ratio	p*
(i) Programme Stirling/ Alternative	4.02	<.05
(ii) Technical feedback Audiotape/videotape	1.10	n.s.
(iii) Interpersonal feedback Tutor present/absent	3.20	n.s.
(iv) Interactions		
(i) and (ii)	.98	n.s.
(i) and (iii)	.95	n.s.
(ii) and (iii)	1.50	n.s.
(i) and (ii) and (iii)	.17	n.s.

* critical value $F_{.05}(1,53) = 4.02$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Pre-treatment and Post-treatment Scores for Treatment Groups

Treatment group	t-value	df	Significance level *
Stirling programme	2.21	30	.05
Alternative programme	3.06	29	.01

* critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
Stirling programme	30	2.04	2.46	2.75
Alternative programme	29	2.05	2.46	2.76

Table 46

Criterion Behaviour:

Analysis and synthesis questions followed by a pupil response "supported"

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
(n = 8)	Stirling programme: Audiotape/tutor present	1.00	4.38
(n = 8)	Audiotape/tutor absent	2.38	4.88
(n = 8)	Videotape/tutor present	.88	4.75
(n = 7)	Videotape/tutor absent	1.71	2.57
Alternative programme:			
(n = 8)	Audiotape/tutor present	1.00	4.88
(n = 7)	Audiotape/tutor absent	1.57	7.43
(n = 8)	Videotape/tutor present	2.00	5.75
(n = 7)	Videotape/tutor absent	1.29	9.43
(n = 31)	Stirling programme	1.48	4.14
(n = 30)	Alternative programme	1.47	6.87
(n = 32)	Tutor present	1.22	4.94
(n = 29)	Tutor absent	1.76	6.08
(n = 31)	Replay by audiotape	1.48	5.39
(n = 30)	Replay by videotape	1.47	5.63

Table 46 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F ratio	p*
(i) Programme Stirling/ Alternative	7.90	<.01
(ii) Technical feedback Audiotape/videotape	.06	n.s.
(iii) Interpersonal feedback Tutor present/absent	1.38	n.s.
(iv) Interactions		
(i) and (ii)	1.53	n.s.
(i) and (iii)	4.15	<.05
(ii) and (iii)	.16	n.s.
(i) and (ii) and (iii)	.96	n.s.

* critical value $F_{.05}(1,53) = 4.02$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Pre-treatment and Post-treatment Scores for Treatment Groups

Treatment group	t-value	df	Significance level*
Stirling programme/tutor present	2.85	15	.02
tutor absent	2.69	14	.02
Alternative programme/ tutor present	3.13	15	.01
tutor absent	7.92	13	.01 (.001)

* critical t-values (Winer, 1971, p.863)

df	Significance level		
	.05	.02	.01
13	2.16	2.65	3.01
14	2.14	2.62	2.98
15	2.13	2.60	2.95

Table 47

Criterion Behaviour:

Total analysis and synthesis questions followed by "original" and supported pupil responses

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
(n = 8)	Stirling programme: Audiotape/tutor present	0.38	2.25
(n = 8)	Audiotape/tutor absent	0.63	1.38
(n = 8)	Videotape/tutor present	0.38	1.63
(n = 7)	Videotape/tutor absent	0.71	1.00
	Alternative programme:		
(n = 8)	Audiotape/tutor present	0.50	2.63
(n = 7)	Audiotape/tutor absent	0.29	2.57
(n = 8)	Videotape/tutor present	0.88	2.25
(n = 7)	Videotape/tutor absent	0.29	3.86
(n = 31)	Stirling programme	0.53	1.56
(n = 30)	Alternative programme	0.62	2.83
(n = 32)	Tutor present	0.54	2.19
(n = 29)	Tutor absent	0.48	2.20
(n = 31)	Replay by audiotape	0.57	2.21
(n = 30)	Replay by videotape	0.71	2.18

Table 47 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F ratio	p*
(i) Programme Stirling/ Alternative	4.88	<.05
(ii) Technical feedback Audiotape/videotape	.00	n.s.
(iii) Interpersonal feedback Tutor present/absent	.00	n.s.
(iv) Interactions		
(i) and (ii)	.70	n.s.
(i) and (iii)	1.78	n.s.
(ii) and (iii)	.70	n.s.
(i) and (ii) and (iii)	.38	n.s.

* critical value $F_{.05}(1,53) = 4.02$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Pre-treatment and Post-treatment Scores for Treatment Groups

Treatment group	t-value	df	Significance level *
Stirling programme	2.76	30	.01
Alternative programme	4.35	29	.01 (.001)

* critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
Stirling programme	30	2.04	2.46	2.75
Alternative programme	29	2.05	2.46	2.76

The analysis of variance revealed a significant difference ($P \leq .05$) in performance between the two teaching programme groups on all nominated pupil response behaviours (Tables 42-47,(b)). On three further occasions, a significant result was found for the treatment interaction between the teaching programme and the inter-personal feedback treatments. These latter results were not independent of each other as each significant interaction involved the behaviour "supported response" in some form.

Following this significant finding, t-tests comparing pre- and post-treatment performance were carried out on the separate interaction groups. For the behaviour "total supported responses", only one interaction group (Alternative programme/tutor absent) recorded a significant result (Table 43,(c)). For the behaviour "total pupil responses, original and supported", two interaction groups recorded a significant result (Stirling programme/tutor present and Alternative programme/tutor absent) (Table 44,(c)). For the behaviour "analysis and synthesis questions followed by a supported response", the results of all four interaction groups proved significant. However, the Stirling programme groups were significant only at the .02 significance level whilst the Alternative programme groups registered significance at the .01 level (Table 46, (c)).

On the three criterion measures for which no significant interactions among treatment variables were found, the differences in mean scores for the Alternative group between pre-treatment and post-treatment lessons were all significant at the .01 level (Tables 42,45,47, (c)). For the Stirling programme group, the

difference was not significant for "original" responses (Table 42, (c)), but was significant at the .01 level for "original" and supported responses following an analysis or synthesis teacher question" (Table 47,(c)).

Post-treatment lesson mean scores generally increased in the direction sought by the teaching programme objectives. However, as with the range of teacher questioning behaviours, with the range of pupil responses behaviours the t-value obtained for the Alternative programme group exceeded the value obtained for the Stirling programme group, indicating a superior performance on those behaviours by the Alternative programme group.

(c) Follow-up behaviours subsequent to the asking of an initial question or responses to such a question

Tables 48-52, provide the summary of the data for these behaviours.

Table 48

Criterion Behaviour:

Total occasions 'no opportunity given to pupils to respond' to a teacher question

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
(n = 8)	Stirling programme: Audiotape/tutor present	3.50	4.00
(n = 8)	Audiotape/tutor absent	4.25	3.75
(n = 8)	Videotape/tutor present	4.50	4.25
(n = 7)	Videotape/tutor absent	6.29	3.00
	Alternative programme:		
(n = 8)	Audiotape/tutor present	4.13	4.13
(n = 7)	Audiotape/tutor absent	4.00	4.29
(n = 8)	Videotape/tutor present	5.00	3.63
(n = 7)	Videotape/tutor absent	3.29	4.57
(n = 31)	Stirling programme	4.64	3.75
(n = 30)	Alternative programme	4.11	4.15
(n = 32)	Tutor present	4.28	4.00
(n = 29)	Tutor absent	4.89	3.90
(n = 31)	Replay by audiotape	3.97	4.04
(n = 30)	Replay by videotape	4.77	3.86

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F ratio	p*
(i) Programme Stirling/ Alternative	.19	n.s.
(ii) Technical feedback Audiotape/videotape	.04	n.s.
(iii) Interpersonal feedback Tutor present/absent	.01	n.s.
(iv) Interactions		
(i) and (ii)	.01	n.s.
(i) and (iii)	.50	n.s.
(ii) and (iii)	.00	n.s.
(i) and (ii) and (iii)	.24	n.s.

* critical value $F_{.05}(1,53) = 4.02$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Pre-treatment and Post-treatment Scores for Treatment Groups

Treatment group	t-value	df	Significance level *
Stirling programme	1.06	30	n.s.
Alternative programme	0.04	29	n.s.

* critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
Stirling programme	30	2.04	2.46	2.75
Alternative programme	29	2.05	2.46	2.76

Table 49

Criterion Behaviour:

Total occasions "no response offered" to a teacher question

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
(n = 8)	Stirling programme: Audiotape/tutor present	8.88	7.38
(n = 8)	Audiotape/tutor absent	8.00	7.00
(n = 8)	Videotape/tutor present	7.50	6.88
(n = 7)	Videotape/tutor absent	5.71	10.57
	Alternative programme:		
(n = 8)	Audiotape/tutor present	5.88	9.25
(n = 7)	Audiotape/tutor absent	7.14	6.86
(n = 8)	Videotape/tutor present	6.63	7.00
(n = 7)	Videotape/tutor absent	6.86	6.86
(n = 31)	Stirling programme	7.52	7.96
(n = 30)	Alternative programme	6.63	7.49
(n = 32)	Tutor present	7.22	7.62
(n = 29)	Tutor absent	6.93	7.83
(n = 31)	Replay by audiotape	7.48	7.62
(n = 30)	Replay by videotape	6.68	7.82

Table 49 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F ratio	p*
(i) Programme Stirling/ Alternative	.15	n.s.
(ii) Technical feedback Audiotape/videotape	.03	n.s.
(iii) Interpersonal feedback Tutor present/absent	.03	n.s.
(iv) Interactions		
(i) and (ii)	1.26	n.s.
(i) and (iii)	1.53	n.s.
(ii) and (iii)	1.78	n.s.
(i) and (ii) and (iii)	.15	n.s.

* critical value $F_{.05}(1,53) = 4.02$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Pre-treatment and Post-treatment Scores for Treatment Groups

Treatment group	t-value	df	Significance level *
stirling programme	0.35	30	n.s.
Alternative programme	0.66	29	n.s.

* critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
Stirling programme	30	2.04	2.46	2.75
Alternative programme	29	2.05	2.46	2.76

Table 50

Criterion Behaviour:

Total teacher prompts

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
(n = 8)	Stirling programme: Audiotape/tutor present	2.75	1.50
(n = 8)	Audiotape/tutor absent	1.75	1.88
(n = 8)	Videotape/tutor present	2.00	2.63
(n = 7)	Videotape/tutor absent	1.29	3.43
Alternative programme:			
(n = 8)	Audiotape/tutor present	2.38	3.63
(n = 7)	Audiotape/tutor absent	1.29	4.00
(n = 8)	Videotape/tutor present	2.00	3.63
(n = 7)	Videotape/tutor absent	2.00	2.86
(n = 31)	Stirling programme	1.95	2.36
(n = 30)	Alternative programme	1.92	3.53
(n = 32)	Tutor present	2.28	2.84
(n = 29)	Tutor absent	1.58	3.04
(n = 31)	Replay by audiotape	2.04	2.75
(n = 30)	Replay by videotape	1.82	3.13

Table 50 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F ratio	P*
(i) Programme Stirling/ Alternative	4.89	<.05
(ii) Technical feedback Audiotape/videotape	.53	n.s.
(iii) Interpersonal feedback Tutor present/absent	.14	n.s.
(iv) Interactions		
(i) and (ii)	3.26	n.s.
(i) and (iii)	.55	n.s.
(ii) and (iii)	.11	n.s.
(i) and (ii) and (iii)	.55	n.s.

* critical value $F_{.05}(1,53) = 4.02$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Pre-treatment and Post-treatment Scores for Treatment Groups

Treatment group	t-value	df	Significance level *
Stirling programme	0.89	30	n.s.
Alternative programme	3.74	29	.01

* critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
Stirling programme	30	2.04	2.46	2.75
Alternative programme	29	2.05	2.46	2.76

Criterion Behaviour:

Total teacher probes

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
(n = 8)	Stirling programme: Audiotape/tutor present	3.38	2.88
(n = 8)	Audiotape/tutor absent	3.38	2.63
(n = 8)	Videotape/tutor present	2.50	4.63
(n = 7)	Videotape/tutor absent	2.29	2.14
(n = 8)	Alternative programme: Audiotape/tutor present	3.38	3.00
(n = 7)	Audiotape/tutor absent	3.43	5.00
(n = 8)	Videotape/tutor present	3.75	6.13
(n = 7)	Videotape/tutor absent	2.14	4.29
(n = 31)	Stirling programme	2.89	3.07
(n = 30)	Alternative programme	3.18	4.60
(n = 32)	Tutor present	3.25	4.16
(n = 29)	Tutor absent	2.81	3.51
(n = 31)	Replay by audiotape	3.39	3.38
(n = 30)	Replay by videotape	2.67	4.29

Table 51 (continued)

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F ratio	p*
(i) Programme Stirling/ Alternative	5.40	<.05
(ii) Technical feedback Audiotape/videotape	1.94	n.s.
(iii) Inter-personal feedback Tutor present/absent	.95	n.s.
(iv) Interactions		
(i) and (ii)	.19	n.s.
(i) and (iii)	1.20	n.s.
(ii) and (iii)	5.27	<.05
(i) and (ii) and (iii)	.37	n.s.

* critical value $F_{.05} (1,53) = 4.02$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Pre-treatment and Post-treatment Scores for Treatment Groups

Treatment group	t-value	df	Significance level*
Stirling programme:			
Replay by audiotape/tutor present	0.52	7	n.s.
Replay by audiotape/tutor absent	0.59	7	n.s.
Replay by videotape/tutor present	1.02	7	n.s.
Replay by videotape/tutor absent	0.12	6	n.s.
Alternative programme:			
Replay by audiotape/tutor present	0.30	7	n.s.
Replay by audiotape/tutor absent	1.51	6	n.s.
Replay by videotape/tutor present	1.27	7	n.s.
Replay by videotape/tutor absent	2.22	6	n.s.

* critical t-values (Winer, 1971, p.863)

df	Significance level		
	.05	.02	.01
6	2.45	3.14	3.71
7	2.36	3.00	3.50

Table 52

Criterion Behaviour:

Analysis plus synthesis category: teacher probes

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Pre-treatment lesson	Post-treatment lesson
(n = 8)	Stirling programme: Audiotape/tutor present	0.63	2.25
(n = 8)	Audiotape/tutor absent	1.75	1.38
(n = 8)	Videotape/tutor present	0.63	1.88
(n = 7)	Videotape/tutor absent	0.71	1.29
	Alternative programme:		
(n = 8)	Audiotape/tutor present	1.00	1.63
(n = 7)	Audiotape/tutor absent	0.71	3.86
(n = 8)	Videotape/tutor present	1.25	4.00
(n = 7)	Videotape/tutor absent	1.43	3.57
(n = 31)	Stirling programme	0.93	1.70
(n = 30)	Alternative programme	1.10	3.26
(n = 32)	Tutor present	0.88	2.44
(n = 29)	Tutor absent	1.15	2.52
(n = 31)	Replay by audiotape	1.02	2.28
(n = 30)	Replay by videotape	1.01	2.68

(b) Analysis of Variance Summary on Post-treatment Scores

Source of variation	F ratio	P*
(i) Programme Stirling/ Alternative	10.08	<.01
(ii) Technical feedback Audiotape/videotape	.68	n.s.
(iii) Interpersonal feedback Tutor present/absent	.03	n.s.
(iv) Interactions		
(i) and (ii)	1.67	n.s.
(i) and (iii)	2.74	n.s.
(ii) and (iii)	1.45	n.s.
(i) and (ii) and (iii)	2.23	n.s.

* critical value $F_{.05}(1,53) = 4.02$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Pre-treatment and Post-treatment Scores for Treatment Groups

Treatment group	t-value	df	Significance level *
Stirling programme	1.81	30	n.s.
Alternative programme	4.81	29	.01 (.001)

* critical t-values (Winer, 1971, p.863)

	df	Significance level		
		.05	.02	.01
Stirling programme	30	2.04	2.46	2.75
Alternative programme	29	2.05	2.46	2.76

For the two behaviours in which a decrease in frequency of occurrence would be consistent with the teaching programme objectives, the analysis of post-treatment results did not indicate any significant differences (Tables 48,49,(b)). Furthermore, the mean differences between pre- and post-treatment performances of the two teaching programme groups were not significant for either behaviour, although a consistent tendency may be noted for the frequency of the behaviour "no pupil response to a teacher question" to increase (Table 49,(a)).

Teacher "prompting" behaviour did increase significantly ($P \leq .01$) between pre- and post-treatment lessons for the Alternative programme group. The analysis of variance revealed a significant result ($P \leq .05$) also for this group.

Analyses of variance revealed a significant result ($P \leq .05$) for the Alternative programme group in teacher "prompts", "probes", and "analysis/synthesis probes" (Tables 50,51,52,(b)). A significant result ($P \leq .05$) was also achieved in teacher "probes" for the interaction between the technical and inter-personal feedback treatments (Table 51, (b)).

As shown by the t-tests for teacher "prompts" and "analysis/synthesis probes", pre- and post-treatment comparisons indicated trends towards the stated objectives by the Alternative group but not by the Stirling programme group (Tables 50,52,(c)). In teacher "probes", the lack of significance between the pre- and post-treatment mean scores for the eight interaction groups was hardly surprising given the small numbers in treatment groups, but inspection did indicate the general tendency for the Alternative groups to improve their performance (Table 51, (a) and (c)).

Performance by the Sample Taking the Stirling Programme in the Spring Semester 1972 and the Different Sample Taking a Similar Stirling Programme in the Autumn Semester 1972

Whilst no attempt will be made to develop an argument in depth arising from the performance of the different samples on the Stirling teaching programme, the evidence set out below in Table 53 suggested that the performance of the sample which took the Stirling programme in the Autumn semester 1972 was quite comparable to the group which took the programme, including microteaching, in the Spring semester 1972.

Application of a t-test of significance between means to the results of these two Stirling programme groups failed to reveal a significant difference for any of the criterion behaviours.

Table 53 lists the mean frequencies of occurrence in the post-treatment lesson of all criterion behaviours for the two samples which took the Stirling programme.

Table 53

Performance of Two Student Teacher Samples on Criterion Behaviours Relevant to the Stirling programme taught in the Spring and Autumn Semesters, 1972

Criterion behaviour	Stirling programme including micro-teaching	
	Mean frequency of occurrence of behaviour in post-treatment lesson	
	Spring semester 1972 sample	Autumn semester 1972 sample
<u>Teacher questioning behaviours</u>		
Asking knowledge/L.O.S. questions	22.44	22.47
Asking comp ⁿ /app./anal./syn. questions	21.88	22.10
Asking analysis or synthesis questions	6.93	7.56
Asking analysis questions	4.73	6.21
Asking synthesis questions	2.20	1.35
<u>Pupil response behaviours</u>		
Total original pupil responses	5.11	4.81
Total supported pupil responses	9.92	10.28
Total original and supported responses	2.88	2.45
Total analysis and synthesis questions followed by		
. original pupil responses	1.10	1.27
. supported pupil responses	3.87	4.14
. original & supported responses	1.83	1.56
<u>Teacher/pupil behaviour following an initial teacher question</u>		
No opportunity to respond	3.65	3.75
No pupil response	7.36	7.96
Total teacher prompts	3.09	2.36
Total teacher probes	3.73	3.07
Total analysis & synthesis level probes	1.95	1.70

Testing of Hypotheses

A detailed statement of these hypotheses has been given in Chapter I (p.39).

Hypothesis 1

Hypothesis 1 focussed on variants in the provision of technical feedback to student teachers following their practice teaching in the microteaching context.

No significant result ($P \leq .05$) was reported for this main effect treatment for any criterion behaviour and hypothesis 1 was therefore not rejected.

Hypothesis 2

This hypothesis related to the provision of staff tutor support to student teachers following their practice teaching.

No significant differences ($P \leq .05$) were found in the performance of any teacher or pupil behaviours between the groups involved with the testing of this hypothesis. As a result, Hypothesis 2 was not rejected.

Hypothesis 5

Differences were sought between the group taking the Stirling programme and that taking the Alternative programme.

For all nominated teacher questioning behaviours and pupil response behaviours, the Alternative programme group achieved a significantly superior result ($P \leq .05$) to that of the Stirling programme group.

In two teacher/pupil interaction behaviours, namely "no opportunity given to pupils to respond to a teacher question" and "no pupil

response to a teacher question", there was no difference ($P \leq .05$) in the performance of the two teaching programme groups. However, for the other three criterion behaviours in this area, the Alternative programme group performance was significantly superior ($P \leq .05$) to that of the Stirling group.

Hypothesis 5 was therefore rejected without qualification for the criterion behaviours in teacher questioning and pupil responses. It was further rejected for the teacher/pupil interaction behaviours, "teacher prompts", "teacher probes", "analysis and synthesis level teacher probes", but was not rejected for the behaviours "no opportunity given to pupils to respond to a teacher question" and "no pupil response to a teacher question".

Hypothesis 6

Significant treatment interactions ($P \leq .05$) were found in a small number of cases.

A significant difference was evident with the teaching programme/inter-personal feedback interaction for three related pupil response behaviours, "total pupil supported responses", "total pupil original and supported responses", and "analysis and synthesis level supported responses". The sub-group Alternative programme/tutor absent recorded a significant t-test result ($P \leq .05$) for each of these behaviours as did the Stirling programme/tutor present sub-group for two of these behaviours.

These results were certainly contrary to the stated hypothesis. However, in view of the lack of independence between the behaviours involved and the generally consistent trend of the results, the evidence appeared to lead to an overall lack of rejection of the hypothesis.

Testing for interactions between the two feedback treatments only produced a significant result ($P \leq .05$) for the behaviour "teacher probes". The overwhelming balance of results which failed to achieve significance led to the conclusion that the hypothesis should not be rejected.

Spring Semester 1973

Consideration of the data collected in the primary school classroom has occurred in two stages:

- (a) the data derived from members of the experimental sample who took the introductory course in education in the Spring semester 1972;
- (b) the data derived from members of the experimental sample who took the introductory course in education in the Autumn semester of that year.

Analysis of the criterion behaviours occurred firstly by a comparison between groups of their performance in the criterion behaviours in the lesson segment taught in the primary school classroom. Further, as an objective of this part of the experimental design was to test for differences between performance in the school classroom and in the microteaching context, the primary school performances were assessed against the post-treatment lesson performances in the microteaching context.

SCHOOL CLASSROOM PERFORMANCE BY STUDENT TEACHERS ORIGINALLY PART OF THE SPRING SEMESTER 1972 SAMPLE

The analyses and presentation of the data followed similar lines to that described earlier for the Spring semester and the Autumn semester 1972.

- (a) Part (a) of each table set out in treatment groups the mean frequency of occurrence of the criterion behaviour in the lesson segment taught in the school classroom, and for those same students the mean frequency of occurrence of the behaviours in the post-treatment lesson previously taught in the

microteaching context. Within the Spring semester 1973 programme, the numbers of student teachers in each of the treatment groups (control and four experimental groups) (see Table 54 below) indicated that it was reasonable to analyse the results according to the original groupings.

Table 54

Sample Population Spring Semester 1972 and in
Spring Semester 1973

Treatment group	Spring semester 1972 Post-treatment lesson (microteaching) Student teacher sample	Spring semester 1973 Lesson segment in primary school classroom Student teacher sample
<u>Control</u> (no micro-teaching)	42	17
<u>Stirling programme</u> (microteaching)		
Audiotape/tutor present	22	7
Audiotape/tutor absent	20	9
Videotape/tutor present	16	6
Videotape/tutor absent	21	11

(b) Part (b) of each table is a summary of the analyses of variance of the results of the control group and the combination of the other four treatment groups, together with an analysis of the results based upon consideration of the

main effects and interactions between feedback variants. The full analysis of variance table for each criterion measure is included in Appendix M. Significance was noted when the variance ratio, F , exceeded the value necessary for significance at the 5 percent level.

- (c) Part (c) set out the comparison of the difference between means for the classroom and the microteaching behaviour for the two groups (control and the combined treatment groups including microteaching in their programme), again using that form of the t -test modified for related samples.

RESULTS

- (a) Teacher questioning behaviours

Tables 55-59 set out the results for the criterion measures concerned with teacher questioning behaviours.

Table 55

Criterion Behaviour:

Total knowledge and lower order synthesis teacher questions

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 17)	No microteaching group control	22.29	17.65
(n = 7)	Microteaching groups Audiotape/tutor present	26.86	14.29
(n = 9)	absent	27.33	24.33
(n = 6)	Videotape/tutor present	20.33	22.83
(n = 11)	absent	23.00	20.73
(n = 33)	All microteaching groups	24.38	20.55

Table 55 (continued)

(b) Summary of Analysis of Variance on Lesson Segment in Primary School Classroom Scores

Source of variation	F ratio	P*
(i) Control vs all other groups	.25	n.s.
(ii) Tutor present/absent	1.67	n.s.
(iii) Audiotape/videotape	1.52	n.s.
(iv) Interaction (ii) and (iii)	.78	n.s.

*critical value $F_{.05}(1,45) = 4.06$ (Guilford, 1965, p.586)

(c) t-tests for Significance of Difference between Means of Post-treatment and Classroom Lesson

Treatment group	t-value	df	Significance level*
Control (no microteaching)	2.33	16	.05
All microteaching groups	1.30	32	n.s.

*critical t-values (Winer, 1971, p.863; Guilford, 1965, p.581)

df	Significance level		
	.05	.02	.01
16	2.12	2.58	2.92
32 (35)	2.03	2.44	2.72

Table 56

Criterion Behaviour:

Total comprehension, application, analysis and synthesis
teacher questions

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro- teaching context	Lesson taught in a primary school classroom
(n = 17)	No microteaching group control	16.41	21.12
(n = 7)	Microteaching groups Audiotape/tutor present	19.71	19.57
(n = 9)	absent	16.67	24.33
(n = 6)	Videotape/tutor present	21.17	19.83
(n = 11)	absent	19.18	24.82
(n = 33)	All microteaching groups	19.18	22.14

Table 56 (continued)

(b) Summary of Analysis of Variance on Lesson Segment in Primary School Classroom Scores

Source of variation	F ratio	P*
(i) Control vs all other groups	.09	n.s.
(ii) Tutor present/absent	1.49	n.s.
(iii) Audiotape/videotape	.01	n.s.
(iv) Interaction (ii) and (iii)	.00	n.s.

*critical value $F_{.05}(1,45) = 4.06$ (Guilford, 1965, p.586)

(c) t-tests for Significance of Difference between Means of Post-treatment and Classroom Lesson

Treatment group	t-value	df	Significance level*
Control (no microteaching)	1.65	16	n.s.
All microteaching groups	1.48	32	n.s.

*critical t-values (Winer, 1971, p.863; Guilford, 1965, p.581)

df	Significance level		
	.05	.02	.01
16	2.12	2.58	2.92
32 (35)	2.03	2.44	2.72

Table 57

Criterion Behaviour:

Total analysis and synthesis teacher questions

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 17)	No microteaching group control	5.94	6.00
(n = 7)	Microteaching groups Audiotape/tutor present	3.86	4.86
(n = 9)	absent	8.67	5.33
(n = 6)	Videotape/tutor present	2.50	3.67
(n = 11)	absent	8.18	7.27
(n = 33)	All microteaching groups	5.80	5.28

Table 57 (continued)

(b) Summary of Analysis of Variance on Lesson Segment in Primary School Classroom Scores

Source of variation	F ratio	P*
(i) Control vs all other groups	.61	n.s.
(ii) Tutor present/absent	.08	n.s.
(iii) Audiotape/videotape	.42	n.s.
(iv) Interaction (ii) and (iii)	.43	n.s.

*critical value $F_{.05}(1,45) = 4.06$ (Guilford, 1965, p.586)

(c) t-tests for Significance of Difference between Means of Post-treatment and Classroom Lesson

Treatment group	t-value	df	Significance level*
Control (no microteaching)	0.03	16	n.s.
All microteaching groups	0.42	32	n.s.

*critical t-values (Winer, 1971, p.863; Guilford, 1965, p.581)

df	Significance level		
	.05	.02	.01
16	2.12	2.58	2.92
32 (35)	2.03	2.44	2.72

Table 58

Criterion Behaviour:

Total analysis teacher questions

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 17)	No microteaching group control	3.65	4.41
(n = 7)	Microteaching groups Audiotape/tutor present	3.00	3.00
(n = 9)	absent	4.89	4.44
(n = 6)	Videotape/tutor present	1.83	3.33
(n = 11)	absent	5.45	5.91
(n = 33)	All microteaching groups	3.79	4.17

Table 58 (continued)

(b) Summary of Analysis of Variance on Lesson Segment in Primary School Classroom Scores

Source of variation	F ratio	p*
(i) Control vs all other groups	.03	n.s.
(ii) Tutor present/absent	1.54	n.s.
(iii) Audiotape/videotape	.31	n.s.
(iv) Interaction (ii) and (iii)	.12	n.s.

*critical value $F_{.05}(1,45) = 4.06$ (Guilford, 1965, p.586)

(c) t-tests for Significance of Difference between Means of Post-treatment and Classroom Lesson

Treatment group	t-value	df	Significance level*
Control (no microteaching)	0.03	16	n.s.
All microteaching groups	0.56	32	n.s.

*critical t-values (Winer, 1971, p.863; Guilford, 1965, p.581)

df	Significance level		
	.05	.02	.01
16	2.12	2.58	2.92
32 (35)	2.03	2.44	2.72

Table 59

Criterion Behaviour:

Total synthesis teacher questions

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 17)	No microteaching group control	1.88	1.59
(n = 7)	Microteaching groups Audiotape/tutor present	0.86	1.86
(n = 9)	absent	3.78	0.89
(n = 6)	Videotape/tutor present	0.67	0.33
(n = 11)	absent	2.72	1.36
(n = 33)	All microteaching groups	2.01	1.11

Table 59 (continued)

(b) Summary of Analysis of Variance on Lesson Segment in Primary School Classroom Scores

Source of variation	F ratio	P*
(i) Control vs all other groups	.32	n.s.
(ii) Tutor present/absent	.00	n.s.
(iii) Audiotape/videotape	.28	n.s.
(iv) Interaction (ii) and (iii)	1.00	n.s.

*critical value $F_{.05}(1,45) = 4.06$ (Guilford, 1965, p.586)

(c) t-tests for Significance of Difference between Means of Post-treatment and Classroom Lesson

Treatment group	t-value	df	Significance level*
Control (no microteaching)	0.19	16	n.s.
All microteaching groups	1.23	32	n.s.

*critical t-values (Winer, 1971, p.863; Guilford, 1965, p.581)

df	Significance level		
	.05	.02	.01
16	2.12	2.58	2.92
32 (35)	2.03	2.44	2.72

The analysis of variance performed on classroom results did not reveal any significant difference ($P \leq .05$) in criterion behaviours between the control group and the combined four treatment groups, nor were there any significant differences in performance on the teacher questioning behaviours among the four treatment groups (Tables 55-59(b)).

Observation of the tabulated data on mean frequencies of occurrence of criterion behaviours (Tables 55-59(a)) indicated that performance in the school classroom was generally comparable to that achieved previously in the microteaching context.

By comparison with the results derived from the post-treatment lesson in the microteaching context, both control group and experimental groups demonstrated a decrease in the mean frequency of occurrence of the lower order question categories of "knowledge" and "lower order synthesis" in the school classroom, together with a corresponding increase in the mean frequency of the sum of all other questioning categories. Yet, of these measures, the only significant t-value ($P \leq .05$) for the difference between means was obtained by the control group for the combined category "knowledge/lower order synthesis" (Table 55, (c)).

Little change was evident in the higher order questioning behaviours "analysis" and/or "synthesis" questions, and a significant t-value ($P \leq .05$) was not obtained for any of these behaviours (Tables 58, 59, (c)).

(b) Pupil response behaviours

Results for the criterion measures concerned with pupil response behaviours are summarized in Tables 60-65.

Table 60

Criterion Behaviour:

Total "original" pupil responses

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 17)	No microteaching group control	4.52	4.47
(n = 7)	Microteaching groups Audiotape/tutor present	5.28	2.57
(n = 9)	absent	6.11	2.67
(n = 6)	Videotape/tutor present	3.33	1.50
(n = 11)	absent	6.82	3.00
(n = 33)	All microteaching groups	5.39	2.44

Table 60 (continued)

(b) Summary of Analysis of Variance on Lesson Segment in Primary School Classroom Scores

Source of variation	F ratio	p*
(i) Control vs all other groups	2.95	n.s.
(ii) Tutor present/absent	.32	n.s.
(iii) Audiotape/videotape	.07	n.s.
(iv) Interaction (ii) and (iii)	.25	n.s.

*critical value $F_{.05}(1,45) = 4.06$ (Guilford, 1965, p.586)

(c) t-tests for Significance of Difference between Means of Post-treatment and Classroom Lesson

Treatment group	t-value	df	Significance level*
Control (no microteaching)	0.03	16	n.s.
All microteaching groups	2.66	32	.02

*critical t-values (Winer, 1971, p.863; Guilford, 1965, p.581)

df	Significance level		
	.05	.02	.01
16	2.12	2.58	2.92
32 (35)	2.03	2.44	2.72

Table 61

Criterion Behaviour:

Total pupil responses "supported"

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 17)	No microteaching group control	7.35	7.47
(n = 7)	Microteaching groups Audiotape/tutor present	9.43	5.57
(n = 9)	absent	10.67	7.67
(n = 6)	Videotape/tutor present	9.17	8.17
(n = 11)	absent	14.45	7.82
(n = 33)	All microteaching groups	10.93	7.31

Table 61 (continued)

(b) Summary of Analysis of Variance on Lesson Segment in Primary School Classroom Scores

Source of variation	F ratio	P*
(i) Control vs all other groups	.01	n.s.
(ii) Tutor present/absent	.23	n.s.
(iii) Audiotape/videotape	.58	n.s.
(iv) Interaction (ii) and (iii)	.46	n.s.

*critical value $F_{.05}(1,45) = 4.06$ (Guilford, 1965, p.586)

(c) t-tests for Significance of Difference between Means of Post-treatment and Classroom Lesson

Treatment group	t-value	df	Significance level*
Control (no microteaching)	.06	16	n.s.
All microteaching groups	1.94	32	n.s.

*critical t-values (Winer, 1971, p.863; Guilford, 1965, p.581)

df	Significance level		
	.05	.02	.01
16	2.12	2.58	2.92
32 (35)	2.03	2.44	2.72

Table 62

Criterion Behaviour:

Total pupil responses "original" and "supported"

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 17)	No microteaching group control	2.76	1.71
(n = 7)	Microteaching groups Audiotape/tutor present	2.43	1.00
(n = 9)	absent	3.22	1.44
(n = 6)	Videotape/tutor present	2.17	1.50
(n = 11)	absent	4.18	2.00
(n = 33)	All microteaching groups	3.00	1.49

Table 62 (continued)

(b) Summary of Analysis of Variance on Lesson Segment in Primary School Classroom Scores

Source of variation	F ratio	P*
(i) Control vs all other groups	.10	n.s.
(ii) Tutor present/absent	.33	n.s.
(iii) Audiotape/videotape	.42	n.s.
(iv) Interaction (ii) and (iii)	.00	n.s.

*critical value $F_{.05}(1,45) = 4.06$ (Guilford, 1965, p.586)

(c) t-tests for Significance of Difference between Means of Post-treatment and Classroom Lesson

Treatment group	t-value	df	Significance level*
Control (no microteaching)	1.30	16	n.s.
All microteaching groups	2.21	32	.05

*critical t-values (Winer, 1971, p.863; Guilford, 1965, p.581)

df	Significance level		
	.05	.02	.01
16	2.12	2.58	2.92
32 (35)	2.03	2.44	2.72

Table 63

Criterion Behaviour:

Total analysis and synthesis teacher questions followed by an "original" pupil response

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 17)	No microteaching group control	0.88	1.71
(n = 7)	Microteaching groups Audiotape/tutor present	1.00	0.86
(n = 9)	absent	1.67	0.56
(n = 6)	Videotape/tutor present	0.83	0.00
(n = 11)	absent	0.91	0.55
(n = 33)	All microteaching groups	1.10	0.49

Table 63 (continued)

(b) Summary of Analysis of Variance on Lesson Segment in Primary School Classroom Scores

Source of variation	F ratio	p*
(i) Control vs all other groups	4.60	<.05
(ii) Tutor present/absent	.03	n.s.
(iii) Audiotape/videotape	.42	n.s.
(iv) Interaction (ii) and (iii)	.40	n.s.

*critical value $F_{.05}(1,45) = 4.06$ (Guilford, 1965, p.586)

(c) t-tests for Significance of Difference between Means of Post-treatment and Classroom Lesson

Treatment group	t-value	df	Significance level*
Control (no microteaching)	1.18	16	n.s.
All microteaching groups	1.86	32	n.s.

*critical t-values (Winer, 1971, p.863; Guilford, 1965, p.581)

df	Significance level		
	.05	.02	.01
16	2.12	2.58	2.92
32 (35)	2.03	2.44	2.72

Table 64

Criterion Behaviour:

Total analysis and synthesis teacher questions followed by a pupil response "supported"

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 17)	No microteaching group control	1.82	3.00
(n = 7)	Microteaching groups Audiotape/tutor present	2.71	1.86
(n = 9)	absent	4.33	2.22
(n = 6)	Videotape/tutor present	2.33	2.83
(n = 11)	absent	5.27	3.64
(n = 33)	All microteaching groups	3.66	2.64

Table 64 (continued)

(b) Summary of Analysis of Variance on Lesson Segment in Primary School Classroom Scores

Source of variation	F ratio	P*
(i) Control vs all other groups	.13	n.s.
(ii) Tutor present/absent	.24	n.s.
(iii) Audiotape/videotape	1.00	n.s.
(iv) Interaction (ii) and (iii)	.03	n.s.

*critical value $F_{.05}(1,45) = 4.06$ (Guilford, 1965, p.586)

(c) t-tests for Significance of Difference between Means of Post-treatment and Classroom Lesson

Treatment group	t-value	df	Significance level*
Control (no microteaching)	0.91	16	n.s.
All microteaching groups	1.06	32	n.s.

*critical t-values (Winer, 1971, p.863; Guilford, 1965, p.581)

df	Significance level		
	.05	.02	.01
16	2.12	2.58	2.92
32 (35)	2.03	2.44	2.72

Table 65 (continued)

(b) Summary of Analysis of Variance on Lesson Segment in Primary School Classroom Scores

Source of variation	F ratio	P*
(i) Control vs all other groups	.07	n.s.
(ii) Tutor present/absent	.08	n.s.
(iii) Audiotape/videotape	.37	n.s.
(iv) Interaction (ii) and (iii)	.16	n.s.

*critical value $F_{.05}(1,45) = 4.06$ (Guilford, 1965, p.586)

(c) t-tests for Significance of Difference between Means of Post-treatment and Classroom Lesson

Treatment group	t-value	df	Significance level*
Control (no microteaching)	.303	16	n.s.
All microteaching groups	1.29	32	n.s.

*critical t-values (Winer, 1971, p.863; Guilford, 1965, p.581)

df	Significance level		
	.05	.02	.01
16	2.12	2.58	2.92
32 (35)	2.03	2.44	2.72

The analysis of variance indicated a significant difference ($P \leq .05$) existed between the control group and the other treatment groups for only one of the response behaviour categories "total analysis and synthesis questions followed by an original response" (Table 63,(b)). By comparison with results in the microteaching context, the mean frequency of this behaviour decreased in the school classroom as did the results for all pupil response behaviours for the microteaching groups (Tables 60-65,(a)). The control group results were not consistent in this respect.

Significant t-values were recorded in only two cases (Tables 60,62,(c)). Both resulted from the performance of the four microteaching groups and both included the behaviour "original" responses. A t-value of 2.66 ($P \leq .02$) was obtained for the behaviour "total original pupil responses" and a t-value of 2.21 ($P \leq .05$) was obtained for the behaviour "total pupil responses original and supported". Both of these significant values represented a decrease in the mean frequency of occurrence of this behaviour between post-treatment and classroom lesson.

(c) Follow-up behaviours subsequent to the asking of an initial question or a response to such a question

Tables 66-.70 summarize the results for these criterion behaviours.

Table 66

Criterion Behaviour:

Total occasions "no opportunity given to pupils to respond"
to teacher question

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro- teaching context	Lesson taught in a primary school classroom
(n = 17)	No microteaching group control	4.27	3.41
(n = 7)	Microteaching groups Audiotape/tutor present	2.57	1.57
(n = 9)	absent	1.67	2.33
(n = 6)	Videotape/tutor present	1.67	5.00
(n = 11)	absent	4.45	3.27
(n = 33)	All microteaching groups	2.59	3.04

Table 66

Criterion Behaviour:

Total occasions "no opportunity given to pupils to respond" to teacher question

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 17)	No microteaching group control	4.27	3.41
(n = 7)	Microteaching groups Audiotape/tutor present	2.57	1.57
(n = 9)	absent	1.67	2.33
(n = 6)	Videotape/tutor present	1.67	5.00
(n = 11)	absent	4.45	3.27
(n = 33)	All microteaching groups	2.59	3.04

Table 66 (continued)

(b) Summary of Analysis of Variance on Lesson Segment in Primary School Classroom Scores

Source of variation	F ratio	P*
(i) Control vs all other groups	.11	n.s.
(ii) Tutor present/absent	.13	n.s.
(iii) Audiotape/videotape	2.73	n.s.
(iv) Interaction (ii) and (iii)	.89	n.s.

*critical value $F_{.05}(1,45) = 4.06$ (Guilford, 1965, p.586)

(c) t-tests for Significance of Difference between Means of Post-treatment and Classroom Lesson

Treatment group	t-value	df	Significance level*
Control (no microteaching)	0.83	16	n.s.
All microteaching groups	0.64	32	n.s.

*critical t-values (Winer, 1971, p.863; Guilford, 1965, p.581)

df	Significance level		
	.05	.02	.01
16	2.12	2.58	2.92
32 (35)	2.03	2.44	2.72

Table 67

Criterion Behaviour:

Total occasions "no response offered" to a teacher question

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 17)	No microteaching group control	6.94	4.29
(n = 7)	Microteaching groups Audiotape/tutor present	4.57	6.43
(n = 9)	absent	6.44	4.17
(n = 6)	Videotape/tutor present	3.17	9.00
(n = 11)	absent	5.82	7.00
(n = 33)	All microteaching groups	5.00	6.55

Table 67 (continued)

(b) Summary of Analysis of Variance on Lesson Segment in Primary School Classroom Scores

Source of variation	F ratio	P*
(i) Control vs all other groups	3.51	n.s.
(ii) Tutor present/absent	3.28	n.s.
(iii) Audiotape/videotape	2.04	n.s.
(iv) Interaction (ii) and (iii)	.01	n.s.

*critical value $F_{.05}(1,45) = 4.06$ (Guilford, 1965, p.586)

(c) t-tests for Significance of Difference between Means of Post-treatment and Classroom Lesson

Treatment group	t-value	df	Significance level*
Control (no microteaching)	1.59	16	n.s.
All microteaching groups	1.67	32	n.s.

*critical t-values (Winer, 1971, p.863; Guilford, 1965, p.581)

df	Significance level		
	.05	.02	.01
16	2.12	2.58	2.92
32 (35)	2.03	2.44	2.72

Table 68

Criterion Behaviour:

Total teacher prompts

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 17)	No microteaching group control	3.47	1.59
(n = 7)	Microteaching groups Audiotape/tutor present	1.43	1.86
(n = 9)	absent	2.33	4.22
(n = 6)	Videotape/tutor present	1.83	1.00
(n = 11)	absent	1.64	3.18
(n = 33)	All microteaching groups	1.81	2.57

Table 68 (continued)

(b) Summary of Analysis of Variance on Lesson Segment in Primary School Classroom Scores

Source of variation	F ratio	P*
(i) Control vs all other groups	2.09	n.s.
(ii) Tutor present/absent	8.04	<.01
(iii) Audiotape/videotape	1.40	n.s.
(iv) Interaction (ii) and (iii)	.01	n.s.

*critical value $F_{.05}(1,45) = 4.06$ (Guilford, 1965, p.586)

(c) t-tests for Significance of Difference between Means of Post-treatment and Classroom Lesson

Treatment group	t-value	df	Significance level*
Control (no microteaching)	1.47	16	n.s.
All microteaching groups	1.86	32	n.s.
Tutor present	0.30	12	n.s.
Tutor absent	3.14	19	.01

*critical t-values (Winer, 1971, p.863; Guilford, 1965, p.581)

df	Significance level		
	.05	.02	.01
12	2.18	2.69	3.06
16	2.12	2.58	2.92
19	2.09	2.54	2.86
32	2.03	2.44	2.72

Table 69

Criterion Behaviour:

Total teacher probes

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 17)	No microteaching group control	2.18	2.59
(n = 7)	Microteaching groups Audiotape/tutor present	1.71	2.43
(n = 9)	absent	3.56	3.56
(n = 6)	Videotape/tutor present	2.67	4.00
(n = 11)	absent	3.00	3.55
(n = 33)	All microteaching groups	2.74	3.38

Table 69 (continued)

(b) Summary of Analysis of Variance on Lesson Segment in Primary School Classroom Scores

Source of variation	F ratio	p*
(i) Control vs all other groups	.61	n.s.
(ii) Tutor present/absent	.08	n.s.
(iii) Audiotape/videotape	.42	n.s.
(iv) Interaction (ii) and (iii)	.43	n.s.

*critical value $F_{.05}(1,45) = 4.06$ (Guilford, 1965, p.586)

(c) t-tests for Significance of Difference between Means of Post-treatment and Classroom Lesson

Treatment group	t-value	df	Significance level*
Control (no microteaching)	0.37	16	n.s.
All microteaching groups	0.83	32	n.s.

*critical t-values (Winer, 1971, p.863; Guilford, 1965, p.581)

df	Significance level		
	.05	.02	.01
16	2.12	2.58	2.92
32 (35)	2.03	2.44	2.72

Table 70

Criterion Behaviour:

Total analysis plus synthesis category teacher probes

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 17)	No microteaching group control	1.47	1.00
(n = 7)	Microteaching groups audiotape/tutor present	0.86	1.14
(n = 9)	absent	2.56	1.00
(n = 6)	Videotape/tutor present	0.83	1.17
(n = 11)	absent	2.55	2.00
(N = 33)	All microteaching groups	1.70	1.33

Tables 70 (continued)

(b) Summary of Analysis of Variance on Lesson Segment in Primary School Classroom Scores

Source of variation	F ratio	P*
(i) Control vs all other groups	.36	n.s.
(ii) Tutor present/absent	.29	n.s.
(iii) Audiotape/videotape	.63	n.s.
(iv) Interaction (ii) and (iii)	.57	n.s.

*critical value $F_{.05}(1,45) = 4.06$ (Guilford, 1965, p.586)

(c) t-tests for Significance of Difference between Means of Post-treatment and Classroom Lesson

Treatment group	t-value	df	Significance level*
Control (no microteaching)	0.82	16	n.s.
All microteaching groups	0.87	32	n.s.

*critical t-values (Winer, 1971, p.863; Guilford, 1965, p.581)

df	Significance level		
	.05	.02	.01
16	2.12	2.58	2.92
32 (35)	2.03	2.44	2.72

With one exception, neither the analysis of variance of classroom lesson results nor the t-test of differences between means of performance in the post-treatment lesson and the classroom lesson indicated a significant result for this range of behaviours (Tables 66-70, (b), (c)). The exception was the inter-personal feedback treatment effect on the behaviour "total teacher prompts" (Table 68, (b)). The analysis of variance indicated significance at the .01 level, and the t-test gave a significant result ($P \leq .01$) for the "tutor absent" group (Table 68, (b), (c))

These results suggested that those students who had not had tutors, unlike those who had, increased their use of 'prompts' in the classroom context.

Interpretation of this finding was made more difficult by the non-significant tendency for the frequency of the behaviour "no pupil response" to be greater in the classroom context for those students who had tutors, but not for those without tutors. The control group seemed to show yet another pattern, with the frequencies of both "no pupil response" and "prompts" being lower (not significantly) in the classroom than in the microteaching context.

SCHOOL CLASSROOM PERFORMANCE BY STUDENT TEACHERS ORIGINALLY PART
OF THE AUTUMN SEMESTER 1972 SAMPLE

The data presentation generally follows the format used for all other results. Tables for the mean frequency of occurrence of the criterion behaviours in the classroom lesson and in the post-treatment lesson set out the data for the main effects only. As shown in Table 71, considerable variation occurred in the numbers of students derived from the different treatment groups within the Autumn

semester 1972 teaching programmes who continued with the Spring semester 1973 programme. The numbers within groups were considered too small to be regarded as a reliable subgroup of the original treatment group. Interpretation of results following the statistical analysis of results of such small samples would have been of doubtful validity.

Therefore mean scores are presented only for the main treatment groups. Following the consistently significant differences found in the Autumn semester between groups taking the Stirling or Alternative programmes - and because of the lack of significant differences in performance arising from the other two main treatment effects - application of the t-tests was made only to the two major teaching programme groups, Stirling and Alternative. The full analysis of variance table for each criterion measure is included in Appendix N.

Table 71

Treatment Group Samples in Spring
Semester 1973

Treatment group	Autumn semester 1972 Post-treatment lesson Student teacher sample	Spring semester 1973 Classroom lesson Student teacher sample
<u>Stirling programme</u>		
Audiotape/tutor present	8	5
Audiotape/tutor absent	8	4
Videotape/tutor present	8	4
Videotape/tutor absent	7	2
<u>Alternative programme</u>		
Audiotape/tutor present	8	3
Audiotape/tutor absent	7	4
Videotape/tutor present	8	5
Videotape/tutor absent	7	3
<u>Main effect groups</u>		
Stirling programme	31	15
Alternative programme	30	15
Replay with tutor present	32	17
Replay with tutor absent	29	13
Replay by audiotape	31	16
Replay by videotape	30	14

RESULTS

(a) Teacher questioning behaviours

The results for these behaviours are summarized in Tables 72 -76.

Table 72

Criterion Behaviour:

Total knowledge and lower order synthesis teacher questions

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 15)	Stirling programme	20.64	17.49
(n = 15)	Alternative programme	13.19	13.64
(n = 17)	Tutor present	18.10	15.02
(n = 13)	Tutor absent	15.73	16.11
(n = 16)	Replay by audiotape	17.10	15.45
(n = 14)	Replay by videotape	16.73	15.68

Table 72 (continued)

(b) Summary of Analysis of Variance on Classroom Lesson Scores

Source of Variation	F ratio	p*
(i) Programme Stirling/ Alternative	1.49	n.s.
(ii) Technical feedback audiotape/ videotape	.23	n.s.
(iii) Interpersonal feedback Tutor present/absent	.01	n.s.
(iv) Interactions (i) and (ii)	.32	n.s.
(i) and (iii)	.38	n.s.
(ii) and (iii)	2.74	n.s.
(i) and (ii) and (iii)	.01	n.s.

*critical value $F_{.05}(1,22) = 4.30$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Post-treatment and Classroom Lesson Scores for the Two Programme Treatment Groups

Treatment group	t-value	df	Significance level*
Stirling programme	0.98	14	n.s.
Alternative programme	0.16	14	n.s.

*critical t-values (Winer, 1962, p.863)

df	Significance level		
	.05	.02	.01
14	2.14	2.62	2.98

Table 73

Criterion Behaviour:

Total comprehension, application, analysis, and synthesis teacher questions

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 15)	Stirling programme	21.61	27.10
(n = 15)	Alternative programme	30.96	26.63
(n = 17)	Tutor present	25.72	27.11
(n = 13)	Tutor absent	26.86	26.63
(n = 16)	Replay by audiotape	24.95	25.27
(n = 14)	Replay by videotape	27.63	28.46

Table 73 (continued)

(b) Summary of Analysis of Variance on Classroom Lesson Scores

Source of Variation	F ratio	p*
(i) Programme Stirling/ Alternative	.02	n.s.
(ii) Technical feedback audiotape/ videotape	.89	n.s.
(iii) Interpersonal feedback Tutor present/absent	.02	n.s.
(iv) Interactions (i) and (ii)	.00	n.s.
(i) and (iii)	.02	n.s.
(ii) and (iii)	.37	n.s.
(i) and (ii) and (iii)	2.76	n.s.

*critical value $F_{.05}(1,22) = 4.30$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Post-treatment and Classroom Lesson Scores for the Two Programme Treatment Groups

Treatment group	t-value	df	Significance level*
Stirling programme	1.71	14	n.s.
Alternative programme	1.12	14	n.s.

*critical t-values (Winer, 1962, p.863)

df	Significance level		
	.05	.02	.01
14	2.14	2.62	2.98

Table 74

Criterion Behaviour:

Total analysis and synthesis teacher questions

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 15)	Stirling programme	7.91	6.68
(n = 15)	Alternative programme	13.06	11.56
(n = 17)	Tutor present	9.04	7.82
(n = 13)	Tutor absent	7.88	10.42
(n = 16)	Replay by audiotape	9.16	8.59
(n = 14)	Replay by videotape	6.81	9.64

Table 74 (continued)

(b) Summary of Analysis of Variance on Classroom Lesson Scores

Source of Variation	F ratio	p*
(i) Programme Stirling/ Alternative	3.84	n.s.
(ii) Technical feedback audiotape/ videotape	.18	n.s.
(iii) Interpersonal feedback Tutor present/absent	1.09	n.s.
(iv) Interactions (i) and (ii)	.71	n.s.
(i) and (iii)	.05	n.s.
(ii) and (iii)	.08	n.s.
(i) and (ii) and (iii)	.69	n.s.

*critical value $F_{.05}(1,22) = 4.30$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Post-treatment and Classroom Lesson Scores for the Two Programme Treatment Groups

Treatment group	t-value	df	Significance level*
Stirling programme	0.68	14	n.s.
Alternative programme	0.56	14	n.s.

*critical t-values (Winer, 1962, p.863)

df	Significance level		
	.05	.02	.01
14	2.14	2.62	2.98

Table 75

Criterion Behaviour:

Total analysis teacher questions

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 15)	Stirling programme	6.23	6.28
(n = 15)	Alternative programme	10.09	8.43
(n = 17)	Tutor present	6.61	5.71
(n = 13)	Tutor absent	9.71	9.00
(n = 16)	Replay by audiotape	7.43	6.86
(n = 14)	Replay by videotape	8.88	7.85

Table 75 (continued)

(b) Summary of Analysis of Variance on Classroom Lesson Scores

Source of Variation	F ratio	p*
(i) Programme Stirling/ Alternative	1.40	n.s.
(ii) Technical feedback audiotape/ videotape	.30	n.s.
(iii) Interpersonal feedback Tutor present/absent	3.26	n.s.
(iv) Interactions (i) and (ii)	1.82	n.s.
(i) and (iii)	.01	n.s.
(ii) and (iii)	.08	n.s.
(i) and (ii) and (iii)	.33	n.s.

*critical value $F_{.05}(1,22) = 4.30$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Post-treatment and Classroom Lesson Scores for the Two Programme Treatment Groups

Treatment group	t-value	df	Significance level*
Stirling programme	0.03	14	n.s.
Alternative programme	0.86	14	n.s.

*critical t-values (Winer, 1962, p.863)

df	Significance level		
	.05	.02	.01
14	2.14	2.62	2.98

Table 76

Criterion Behaviour:

Total synthesis teacher questions

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 15)	Stirling programme	1.69	0.40
(n = 15)	Alternative programme	2.97	3.13
(n = 17)	Tutor present	2.43	2.11
(n = 13)	Tutor absent	2.23	1.42
(n = 16)	Replay by audiotape	1.73	1.73
(n = 14)	Replay by videotape	2.93	1.79

Table 76 (continued)

(b) Summary of Analysis of Variance on Classroom Lesson Scores

Source of Variation	F ratio	p*
(i) Programme Stirling/ Alternative	5.09	<.05
(ii) Technical feedback audiotape/ videotape	.00	n.s.
(iii) Interpersonal feedback Tutor present/absent	.33	n.s.
(iv) Interactions (i) and (ii)	.09	n.s.
(i) and (iii)	.11	n.s.
(ii) and (iii)	1.03	n.s.
(i) and (ii) and (iii)	.72	n.s.

*critical value $F_{.05}(1,22) = 4.30$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Post-treatment and Classroom Lesson Scores for the Two Programme Treatment Groups

Treatment group	t-value	df	Significance level*
Stirling programme	1.70	14	n.s.
Alternative programme	0.12	14	n.s.

*critical t-values (Winer, 1962, p.863)

df	Significance level		
	.05	.02	.01
14	2.14	2.62	2.98

A significant difference ($P \leq .05$) was apparent between the Stirling and Alternative programmes for the behaviour "asking synthesis questions" (Table 76, (b)). No other significant result eventuated from the analyses of variance of classroom lesson performances (Tables 72-76, (b)). The performance of the Alternative programme group continued to be superior to that of the Stirling programme group but, with the above exception, not at a level which achieved significance (Tables 72-76, (b)). Apart from this, no clear pattern was evident in the results either for the other main effect groups, or when comparing performance in the post-treatment lesson in microteaching and the lesson segment in the classroom (Tables 72-76, (a)). For this latter situation, for each questioning behaviour the t-value was far below the critical value for significance (Tables 72-76, (c)).

(b) Pupil response behaviours

The results for the criterion measures in the area of pupil response behaviours are summarized in Tables 77-82.

Table 77

Criterion Behaviour:

Total "original" pupil responses

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 15)	Stirling programme	5.73	4.60
(n = 15)	Alternative programme	7.20	7.47
(n = 17)	Tutor present	5.82	6.06
(n = 13)	Tutor absent	7.31	6.00
(n = 16)	Replay by audiotape	6.50	6.69
(n = 14)	Replay by videotape	6.43	5.29

Table 77 (continued)

(b) Summary of Analysis of Variance on Classroom Lesson Scores

Source of Variation	F ratio	P*
(i) Programme Stirling/ Alternative	1.82	n.s.
(ii) Technical feedback audiotape/ videotape	.72	n.s.
(iii) Interpersonal feedback Tutor present/absent	.02	n.s.
(iv) Interactions (i) and (ii)	.00	n.s.
(i) and (iii)	.19	n.s.
(ii) and (iii)	.00	n.s.
(i) and (ii) and (iii)	.74	n.s.

*critical value $F_{.05}(1,22) = 4.30$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Post-treatment and Classroom Lesson Scores for the Two Programme Treatment Groups

Treatment group	t-value	df	Significance level*
Stirling programme	0.88	14	n.s.
Alternative programme	0.70	14	n.s.

*critical t-values (Winer, 1962, p.863)

df	Significance level		
	.05	.02	.01
14	2.14	2.62	2.98

Table 78

Criterion Behaviour:

Total pupil responses "supported"

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 15)	Stirling programme	12.73	10.87
(n = 15)	Alternative programme	12.07	13.07
(n = 17)	Tutor present	11.41	11.59
(n = 13)	Tutor absent	10.56	12.46
(n = 16)	Replay by audiotape	11.19	13.50
(n = 14)	Replay by videotape	13.07	10.21

Table 78 (continued)

(b) Summary of Analysis of Variance on Classroom Lesson Scores

Source of Variation	F ratio	P*
(i) Programme Stirling/ Alternative	1.48	n.s.
(ii) Technical feedback audiotape/ videotape	3.03	n.s.
(iii) Interpersonal feedback Tutor present/absent	.10	n.s.
(iv) Interactions (i) and (ii)	.00	n.s.
(i) and (iii)	.01	n.s.
(ii) and (iii)	.11	n.s.
(i) and (ii) and (iii)	1.52	n.s.

*critical value $F_{.05}(1,22) = 4.30$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Post-treatment and Classroom Lesson Scores for the Two Programme Treatment Groups

Treatment group	t-value	df	Significance level*
Stirling programme	0.95	14	n.s.
Alternative programme	0.53	14	n.s.

*critical t-values (Winer, 1962, p.863)

df	Significance level		
	.05	.02	.01
14	2.14	2.62	2.98

Table 79

Criterion Behaviour:

Total pupil responses "original" and "supported"

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 15)	Stirling programme	2.93	2.60
(n = 15)	Alternative programme	3.00	4.47
(n = 17)	Tutor present	2.35	3.47
(n = 13)	Tutor absent	3.77	3.62
(n = 16)	Replay by audiotape	3.13	3.88
(n = 14)	Replay by videotape	2.86	3.14

Table 79 (continued)

(b) Summary of Analysis of Variance on Classroom Lesson Scores

Source of Variation	F ratio	p*
(i) Programme Stirling/ Alternative	1.77	n.s.
(ii) Technical feedback audiotape/ videotape	.48	n.s.
(iii) Interpersonal feedback Tutor present/absent	.01	n.s.
(iv) Interactions (i) and (ii)	.27	n.s.
(i) and (iii)	.12	n.s.
(ii) and (iii)	.38	n.s.
(i) and (ii) and (iii)	2.12	n.s.

*critical value $F_{.05}(1,22) = 4.30$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Post-treatment and Classroom Lesson Scores for the Two Programme Treatment Groups

Treatment group	t-value	df	Significance level*
Stirling programme	0.16	14	n.s.
Alternative programme	0.11	14	n.s.

*critical t-values (Winer, 1962, p.863)

df	Significance level		
	.05	.02	.01
14	2.14	2.62	2.98

Table 80

Criterion Behaviour:

Total analysis and synthesis teacher questions followed by
an "original" pupil response

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro- teaching context	Lesson taught in a primary school classroom
(n = 15)	Stirling programme	1.33	1.13
(n = 15)	Alternative programme	2.27	2.27
(n = 17)	Tutor present	2.24	1.82
(n = 13)	Tutor absent	1.23	1.54
(n = 16)	Replay by audiotape	1.44	1.75
(n = 14)	Replay by videotape	2.21	1.64

Table 80 (continued)

(b) Summary of Analysis of Variance on Classroom Lesson Scores

Source of Variation	F ratio	p*
(i) Programme Stirling/ Alternative	1.14	n.s.
(ii) Technical feedback audiotape/ videotape	.11	n.s.
(iii) Interpersonal feedback Tutor present/absent	.15	n.s.
(iv) Interactions (i) and (ii)	.37	n.s.
(i) and (iii)	1.44	n.s.
(ii) and (iii)	.04	n.s.
(i) and (ii) and (iii)	.12	n.s.

*critical value $F_{.05}(1,22) = 4.30$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Post-treatment and Classroom Lesson Scores for the Two Programme Treatment Groups

Treatment group	t-value	df	Significance level*
Stirling programme	0.16	14	n.s.
Alternative programme	0.11	14	n.s.

*critical t-values (Winer, 1962, p.863)

df	Significance level		
	.05	.02	.01
14	2.14	2.62	2.98

Table 81

Criterion Behaviour:

Total analysis and synthesis teacher questions followed by a pupil response "supported"

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 15)	Stirling programme	5.27	3.13
(n = 15)	Alternative programme	5.67	6.87
(n = 17)	Tutor present	4.06	3.88
(n = 13)	Tutor absent	7.31	6.46
(n = 16)	Replay by audiotape	5.56	5.50
(n = 14)	Replay by videotape	5.36	4.43

Table 81 (continued)

(b) Summary of Analysis of Variance on Classroom Lesson Scores

Source of Variation	F ratio	p*
(i) Programme Stirling/ Alternative	6.75	<.05
(ii) Technical feedback audiotape/ videotape	.65	n.s.
(iii) Interpersonal feedback Tutor present/absent	2.74	n.s.
(iv) Interactions (i) and (ii)	.65	n.s.
(i) and (iii)	.04	n.s.
(ii) and (iii)	.02	n.s.
(i) and (ii) and (iii)	.61	n.s.

*critical value $F_{.05}(1,22) = 4.30$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Post-treatment and Classroom Lesson Scores for the Two Programme Treatment Groups

Treatment group	t-value	df	Significance level*
Stirling programme	1.63	14	n.s.
Alternative programme	0.89	14	n.s.

*critical t-values (Winer, 1962, p.863)

df	Significance level		
	.05	.02	.01
14	2.14	2.62	2.98

Table 82

Criterion Behaviour:

Total analysis and synthesis teacher questions followed by an "original" and "supported" pupil response

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 15)	Stirling programme	2.13	1.53
(n = 15)	Alternative programme	2.07	3.13
(n = 17)	Tutor present	1.59	1.82
(n = 13)	Tutor absent	2.77	2.92
(n = 16)	Replay by audiotape	2.19	2.50
(n = 14)	Replay by videotape	2.00	2.07

Table 82 (continued)

(b) Summary of Analysis of Variance on Classroom Lesson Scores

Source of Variation	F ratio	p*
(i) Programme Stirling/ Alternative	2.40	n.s.
(ii) Technical feedback audiotape/ videotape	.24	n.s.
(iii) Interpersonal feedback Tutor present/absent	1.33	n.s.
(iv) Interactions (i) and (ii)	.00	n.s.
(i) and (iii)	.24	n.s.
(ii) and (iii)	.28	n.s.
(i) and (ii) and (iii)	1.57	n.s.

*critical value $F_{.05}(1,22) = 4.30$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Post-treatment and Classroom Lesson Scores for the Two Programme Treatment Groups

Treatment group	t-value	df	Significance level*
Stirling programme	0.82	14	n.s.
Alternative programme	1.40	14	n.s.

*critical t-values (Winer, 1962, p.863)

df	Significance level		
	.05	.02	.01
14	2.14	2.62	2.98

Only one significant result was indicated by the analysis of variance of classroom lesson results. The relevant variable was the combination of "analysis" and "synthesis" teacher questions followed by a "supported" pupil response, and the main effect concerned was the teaching programme. Such a result might be anticipated following consideration of the different frequencies of these categories of questions asked by these two treatment groups (Table 74, (a)). No significant result occurred with the application of the t-test to the differences between means of the results from the classroom lesson and from the post-treatment lesson (Tables 77 - 82, (b), (c)).

The Alternative group performance was consistent with the teaching programme objectives and superior on all behaviours to the Stirling programme group performance, however the level of performance was no longer significantly different ($P \leq .05$). (Tables 77 - 82, (a)).

Comparable performances were recorded by the other main effects groups, and no pattern of performance appeared evident which might have resulted from the different treatments.

(c) Follow-up behaviours subsequent to the asking of an initial question or a response to such a question

The results for these behaviours follow in Tables 83 - 87.

Table 83

Criterion Behaviour:

Total occasions "no opportunity given to pupils to respond" to a teacher question

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 15)	Stirling programme	3.20	4.93
(n = 15)	Alternative programme	3.33	3.07
(n = 17)	Tutor present	3.24	4.18
(n = 13)	Tutor absent	3.31	3.77
(n = 16)	Replay by audiotape	2.88	3.25
(n = 14)	Replay by videotape	3.71	4.86

Table 83 (continued)

(b) Summary of Analysis of Variance on Classroom Lesson Scores

Source of Variation	F ratio	p*
(i) Programme Stirling/ Alternative	7.12	<.05
(ii) Technical feedback audiotape/ videotape	4.24	n.s.
(iii) Interpersonal feedback Tutor present/absent	.01	n.s.
(iv) Interactions (i) and (ii)	.05	n.s.
(i) and (iii)	.79	n.s.
(ii) and (iii)	.71	n.s.
(i) and (ii) and (iii)	.97	n.s.

*critical value $F_{.05}(1,22) = 4.30$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Post-treatment and Classroom Lesson Scores for the Two Programme Treatment Groups

Treatment group	t-value	df	Significance level*
Stirling programme	3.07	14	.01
Alternative programme	0.26	14	n.s.

*critical t-values (Winer, 1962, p.863)

df	Significance level		
	.05	.02	.01
14	2.14	2.62	2.98

Table 84

Criterion Behaviour:

Total occasions "no response offered" to a teacher question

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 15)	Stirling programme	6.67	3.80
(n = 15)	Alternative programme	7.13	4.80
(n = 17)	Tutor present	7.24	3.65
(n = 13)	Tutor absent	6.46	5.15
(n = 16)	Replay by audiotape	7.06	3.31
(n = 14)	Replay by videotape	6.71	4.75

Table 84 (continued)

(b) Summary of Analysis of Variance on Classroom Lesson Scores

Source of Variation	F ratio	P*
(i) Programme Stirling/ Alternative	.18	n.s.
(ii) Technical feedback audiotape/ videotape	5.36	<.05
(iii) Interpersonal feedback Tutor present/absent	3.89	n.s.
(iv) Interactions (i) and (ii)	1.52	n.s.
(i) and (iii)	.35	n.s.
(ii) and (iii)	.00	n.s.
(i) and (ii) and (iii)	.82	n.s.

*critical value $F_{.05}(1,22) = 4.30$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Post-treatment and Classroom Lesson Scores for the Two Programme Treatment Groups

Treatment group	t-value	df	Significance level*
Stirling programme	2.52	14	.05
Alternative programme	1.68	14	n.s.

*critical t-values (Winer, 1962, p.863)

df	Significance level		
	.05	.02	.01
14	2.14	2.62	2.98

Table 85

Criterion Behaviour:

Teacher prompts

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 15)	Stirling programme	2.00	1.33
(n = 15)	Alternative programme	3.80	1.47
(n = 17)	Tutor present	2.94	1.41
(n = 13)	Tutor absent	2.92	1.38
(n = 16)	Replay by audiotape	2.69	0.94
(n = 14)	Replay by videotape	3.14	1.93

Table 85 (continued)

(b) Summary of Analysis of Variance on Classroom Lesson Scores

Source of Variation	F ratio	p*
(i) Programme Stirling/ Alternative	.00	n.s.
(ii) Technical feedback audiotape/ videotape	5.31	<.05
(iii) Interpersonal feedback Tutor present/absent	.20	n.s.
(iv) Interactions (i) and (ii)	4.80	<.05
(i) and (iii)	.11	n.s.
(ii) and (iii)	.06	n.s.
(i) and (ii) and (iii)	.47	n.s.

*critical value $F_{.05}(1,22) = 4.30$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Post-treatment and Classroom Lesson Scores for the Two Programme Treatment Groups

Treatment group	t-value	df	Significance level*
Stirling programme	1.12	14	n.s.
Alternative programme	4.53	14	.01

*critical t-values (Winer, 1962, p.863)

df	Significance level		
	.05	.02	.01
14	2.14	2.62	2.98

Table 86

Criterion Behaviour:

Teacher probes

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 15)	Stirling programme	3.33	4.73
(n = 15)	Alternative programme	4.60	3.80
(n = 17)	Tutor present	4.18	4.24
(n = 13)	Tutor absent	3.69	3.54
(n = 16)	Replay by audiotape	3.38	3.81
(n = 14)	Replay by videotape	4.64	4.79

Table 86 (continued)

(b) Summary of Analysis of Variance on Classroom Lesson Scores

Source of Variation	F ratio	p*
(i) Programme Stirling/ Alternative	.24	n.s.
(ii) Technical feedback audiotape/ videotape	1.90	n.s.
(iii) Interpersonal feedback Tutor present/absent	.23	n.s.
(iv) Interactions (i) and (ii)	1.18	n.s.
(i) and (iii)	.04	n.s.
(ii) and (iii)	.31	n.s.
(i) and (ii) and (iii)	.01	n.s.

*critical value $F_{.05}(1,22) = 4.30$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Post-treatment and Classroom Lesson Scores for the Two Programme Treatment Groups

Treatment group	t-value	df	Significance level*
Stirling programme	1.94	14	n.s.
Alternative programme	0.82	14	n.s.

*critical t-values (Winer, 1962, p.863)

df	Significance level		
	.05	.02	.01
14	2.14	2.62	2.98

Table 87

Criterion Behaviour:

Analysis plus synthesis category teacher probes

(a) Frequency of Occurrence of Behaviour by Treatment Group

Treatment group		Mean frequency of occurrence of behaviour	
		Post-treatment lesson in micro-teaching context	Lesson taught in a primary school classroom
(n = 15)	Stirling programme	1.80	1.33
(n = 15)	Alternative programme	2.93	2.40
(n = 17)	Tutor present	2.29	1.94
(n = 13)	Tutor absent	2.46	1.77
(n = 16)	Replay by audiotape	2.31	1.75
(n = 14)	Replay by videotape	2.43	2.07

Table 87 (continued)

(b) Summary of Analysis of Variance on Classroom Lesson Scores

Source of Variation	F ratio	p*
(i) Programme Stirling/ Alternative	1.63	n.s.
(ii) Technical feedback audiotape/ videotape	.01	n.s.
(iii) Interpersonal feedback Tutor present/absent	.11	n.s.
(iv) Interactions (i) and (ii)	.22	n.s.
(i) and (iii)	.14	n.s.
(ii) and (iii)	.07	n.s.
(i) and (ii) and (iii)	.05	n.s.

*critical value $F_{.05}(1,22) = 4.30$ (Guilford, 1965, p.586)

(c) t-values for Difference between Means of Post-treatment and Classroom Lesson Scores for the Two Programme Treatment Groups

Treatment group	t-value	df	Significance level*
Stirling programme	0.97	14	n.s.
Alternative programme	1.04	14	n.s.

*critical t-values (Winer, 1962, p.863)

df	Significance level		
	.05	.02	.01
14	2.14	2.62	2.98

A significant result was revealed by the analysis of variance on three occasions across this range of teacher and pupil behaviours. For the behaviour "no opportunity given to pupils to respond to a teacher question", the teaching programme main effect proved significant (Table 83, (b)), with the Stirling programme group recording a substantially higher frequency of occurrence of this behaviour in the classroom (Table 83, (a)). The technical feedback effect proved significant for the two behaviours "no pupil response to a teacher question" (Table 84, (b)), and "prompts" (Table 85, (b)). In the latter case, the interaction effect of teaching programme and technical feedback was significant also (Table 85, (b)). There does not appear to be any obvious explanation of these results arising out of the particular treatments applied.

Some variations occurred in behaviours in the school classrooms compared to those behaviours in the post-treatment lesson.

For the Stirling programme group, there were significant differences in the frequency of occurrence of the behaviours "no opportunity given to pupils to respond to a teacher question" and "no pupil response to a teacher question" (Tables 83, 84, (c)). A relative increase in the frequency of occurrence of the former behaviour accounted for the significant finding ($P \leq .01$), whilst a decrease occurred in the latter behaviour in the classroom lesson (Tables 83, 84, (c)).

The decrease in Alternative programme group performance in the behaviour "no pupil response to a teacher question" was matched by a significant decrease ($P \leq .05$) in teacher "prompting" behaviour by this group (Table 85 (a), (c)).

Testing of Hypotheses

The same questions were asked of the Spring semester 1973 sample but in this case their practice teaching was taken in a primary school classroom. Hypotheses searched for differences in performance arising from treatment variants in technical feedback, inter-personal feedback, the provision of microteaching experiences, teaching programmes and certain interactions of these treatments.

Hypotheses 1, 2, 3, 4, and 5 followed exactly the hypotheses set down earlier for the Spring semester 1972 (Chapter I, p.39) and the Autumn semester programme 1972 (Chapter I, p.41). As applied to the Spring semester 1973 population hypothesis 6 only related to the interaction of the teaching programme variable with either the technical feedback variable or the inter-personal feedback variable.

The analyses of variance of the data revealed few significant results ($P \leq .05$) across all groups and behaviours relevant to the primary classroom teaching practice. For the sample derived from the Spring semester 1972

- (a) performance in the behaviour "analysis and synthesis teacher questions followed by an original pupil response" was significantly different ($P \leq .05$) for the control group and the sum of the microteaching groups (Table 63,(b));
- (b) a significant difference ($P \leq .05$) in performance occurred between the inter-personal treatment groups for the behaviour total teacher "prompts" (Table 68, (b));

For the sample derived from the Autumn semester 1972

- (a) the performance of the two teaching programme groups was significantly different ($P \leq .05$) for the behaviours
- (i) total "synthesis" teacher questions (Table 76, (b));
 - (ii) total "analysis" and "synthesis" teacher questions followed by a "supported" pupil response (Table 81 (b));
- and
- (iii) total occasions "no opportunity given to pupils to respond to a teacher question" (Table 83, (b));
- (b) the performance of the technical feedback groups was significantly different ($P \leq .05$) for two behaviours
- (i) total occasions "no response to a teacher question" (Table 84, (b));
 - (ii) teacher "prompts" (Table 85, (b));
- (c) the interaction effect teaching programme/technical feedback was significant ($P \leq .05$) for the behaviour teacher "prompts" (Table 85, (b)).

Beyond this it should be noted that, although usually not significant, the performance of the Alternative programme group continued to be superior to that of the Stirling group, (Tables 72-87, (a)).

Given such a small number of significant findings relative to the total number of criterion behaviours, and the lack of consistent involvement of any particular treatment group with these findings, no one of the hypotheses 1, 2, 3, 4, 5, or 6 could be rejected.

Hypothesis 7 compared treatment group performances between the two practice teaching contexts in the three areas of criterion behaviours (see Chapter I, p.42).

(a) Teacher questioning behaviours

In the school classroom, the control group significantly ($P \leq .05$) decreased their use of the lower order questioning categories of "knowledge" and "lower order synthesis" (Table 55,(a)). No other difference in the performance of a treatment group achieved significance ($P \leq .05$). Generally the treatment group changes in behaviour which were achieved in the post-treatment lesson were maintained in the school classroom lesson (Tables 55-59(a)).

Hypothesis 7 could not therefore be rejected on the basis of the evidence collected.

(b) Pupil response behaviours

In the classroom situation as compared to the microteaching context, the Spring semester 1972 microteaching groups recorded decreased levels for all pupil response behaviours (Tables 60-65 (a)). These decreases were significant ($P \leq .05$) for two behaviours, total pupil "original" responses and total pupil responses "original and supported" (Table 60, 62,(c)). This pattern of performance was not replicated by the Stirling microteaching groups in the Autumn semester or by the Alternative programme groups (Tables 77 - 82).

Lack of consistency in achievement of the significant performance differential led to the conclusion that, with some small degree of caution, hypothesis 7 could not be rejected for the pupil response behaviours.

- (c) Follow-up behaviours subsequent to the asking of an initial question or a response to such a question

Significant differences in performance in the school classroom lesson occurred with three behaviours.

The Autumn semester Stirling groups differed ($P < .05$) in their performance in the behaviours "no opportunity given to pupils to respond to a teacher question" and "no pupil response to a teacher question".

In the former case the classroom lesson performance showed a significant increase on the post-treatment lesson performance, in the latter case a decrease. Further, the Alternative programme group performance decreased significantly ($P < .05$) for the behaviour total teacher "prompts", but for the large majority of treatment groups and criterion measures, no difference ($P < .05$) was recorded between the performance in the classroom lesson and the post-treatment lesson in the microteaching context. Therefore, in the absence of any consistent pattern of differences it was decided not to reject hypothesis 7.

Summary

In the initial Spring semester experiment, no clear pattern of difference was evident in the performance of the different feedback treatment groups taking the full Stirling microteaching programme. Indeed when these groups were considered as a combined group, their performance was not significantly different from that of the control group which did not include in their programme practice teaching in the microteaching context. Significant changes in behaviour were noted between pre- and post-treatment lessons, and

these were consistent with the changes sought through the teaching programme. Improved performances were achieved both by the control group and the microteaching groups, although there was a generally consistent trend for the performance of the combined microteaching groups to be superior to that of the control group.

It has been noted that the performance of the Stirling programme sample in the Autumn semester experiment was comparable to that of the different sample taking the same programme in the Spring semester 1972, but in the Autumn semester this performance was clearly and consistently inferior to that recorded by the sample taking the Alternative programme.

Overall, the level and general trend of these results were maintained in the final Spring semester 1973 experiment. The only major alteration to this situation - which occurred when the practice teaching component was transferred to the school classroom - was that, although their performance continued to be superior, the performance of the Alternative programme group was no longer significantly superior on most criterion measures.

CHAPTER V

ANALYSIS OF RESULTS RELATING TO STUDENT
TEACHER AND STAFF TUTOR ATTITUDINAL MEASURES

In Chapter II (p. 99) a rationale was given for the development of questionnaire materials designed to assess the attitudes of student teachers and staff tutors to the teaching programmes encompassed by this study. This chapter will report the results of these questionnaires administered during the Autumn semester 1972 and the Spring semester 1973.

Autumn Semester 1972

Immediately following the completion of the experimental programme, questionnaire responses were sought from student teachers and from staff tutors involved in both the Stirling and Alternative teaching programmes. The questionnaires are included in Appendices F, G.

QUESTIONNAIRE TO STUDENT TEACHERS

Section One

The first section of this questionnaire contained twenty-one statements of behaviours relevant to the use of questioning in the classroom. Student teachers were asked to indicate whether they thought these behaviours were valuable objectives for classroom teaching; whether the programme of lectures, seminars, and micro-teaching sessions had helped them to plan for and practise the behaviours; and whether they believed that their performance in each behaviour had improved during the programme (this latter

response was sought following the post-treatment lesson).

Thirteen statements (numbered 1, 3, 4, 7, 8, 10, 11, 12, 14, 15, 18, 19, 20) contained operational definitions of different questioning behaviours such as "comprehension" questions, "analysis" questions, "probes". The question types were not identified by name. Five statements (numbered 2, 5, 9, 16, 17) contained general descriptions of appropriate teacher behaviour in the area of questioning. All eighteen statements represented objectives of the programmes outlined to students in the distributed printed materials (see Appendix F). The remaining three statements (6, 13, 21), although concerned with questioning in the classroom, did not feature as programme objectives. These statements were included to validate the questionnaire. It was expected that the percentage of positive responses to these statements (i.e. students expressing agreement with the statements in terms of the three criteria offered) would be much lower than the positive responses to other statements.

A full tabulation of the responses classified according to treatment groups is included in Appendix O. To determine the measure of association, a chi-square analysis (Guilford, 1965, p.240) was applied to the group results for the independent variables teaching programme (Stirling/Alternative), technical feedback (replay by audiotape/videotape), and inter-personal feedback (tutor present/not present). No measure was high enough to be statistically significant, but certain trends were evident in the data.

Table 88 summarizes the responses for this section of the questionnaire.

Responses were received from sixty of the sixty-one students enrolled for the Autumn semester. These sixty completed questionnaires were spread over the main treatment groups as follows:

Teaching programme

Stirling n = 30

Alternative n = 30

Technical feedback

Replay by audiotape n = 31

Replay by videotape n = 29

Inter-personal feedback

Tutor present n = 31

Tutor absent n = 29

Table 88
 Summary of Responses to Questionnaire
 for Student Teachers, Section One

Statement of behaviour 1:

To ask questions designed to encourage the pupils to use previously learned ideas in contexts different from those encountered.

Treatment group	Percentage responding YES		
	Objective valuable	Programme helpful	Improvement claimed
Teaching programme:			
(n = 30) Stirling	100	70	67
(n = 30) Alternative	100	63	63
Technical feedback:			
(n = 31) Audiotape	100	58	55
(n = 29) Videotape	100	76	76
Inter-personal feedback:			
(n = 31) Tutor present	100	74	65
(n = 29) Tutor absent	100	59	66

Table 88 (continued)

Statement of behaviour 2:

To structure questions which do not imply a particular answer or impose an unintentional bias upon the answer.

Treatment group	Percentage responding YES		
	Objective valuable	Programme helpful	Improvement claimed
Teaching programme:			
Stirling	90	77	77
Alternative	97	67	67
Technical feedback:			
Audiotape	97	71	71
Videotape	90	72	72
Inter-personal feedback:			
Tutor present	97	71	84
Tutor absent	90	72	59

Statement of behaviour 3:

To ask questions which determine the pupils' initial interests, attitudes, knowledge, or skills relevant to the lesson to follow

Teaching programme:			
Stirling	97	73	70
Alternative	93	60	47
Technical feedback:			
Audiotape	94	58	48
Videotape	90	76	69
Inter-personal feedback:			
Tutor present	97	58	48
Tutor absent	90	76	69

Table 88 (continued)

Statement of behaviour 4:

To ask questions designed to set the pupils a task which is planned to help them achieve selected goals.

Treatment group	Percentage responding YES		
	Objective valuable	Programme helpful	Improvement claimed
Teaching programme:			
Stirling	83	53	50
Alternative	83	53	40
Technical feedback:			
Audiotape	77	45	45
Videotape	90	62	45
Inter-personal feedback:			
Tutor present	87	52	48
Tutor absent	79	55	41

Statement of behaviour 5:

To ask questions designed to encourage the pupils to produce new ideas based upon a sifting of ideas from many sources.

Teaching programme:			
Stirling	97	50	70
Alternative	100	77	67
Technical feedback:			
Audiotape	97	52	61
Videotape	100	76	76
Inter-personal feedback:			
Tutor present	100	65	74
Tutor absent	97	62	62

Table 88 (continued)

Statement of behaviour 6;

To ask questions only when one is facing the pupils.

Treatment group	Percentage responding YES		
	Objective valuable	Programme helpful	Improvement claimed
Teaching programme:			
Stirling	43	23	23
Alternative	27	17	23
Technical feedback:			
Audiotape	35	23	26
Videotape	34	17	21
Inter-personal feedback:			
Tutor present	32	23	19
Tutor absent	38	17	28

Statement of behaviour 7:

To ask questions which seek to establish whether pupils have understood concepts or relationships in the material under discussion.

Teaching programme:			
Stirling	100	93	87
Alternative	100	90	93
Technical feedback:			
Audiotape	100	97	90
Videotape	100	86	90
Inter-personal feedback:			
Tutor present	100	90	97
Tutor absent	100	93	83

Table 88 (continued)

Statement of behaviour 8:

To ask questions as a follow-up to pupil responses which are vague or only partial completions of the set tasks.

Treatment group	Percentage responding YES		
	Objective valuable	Programme helpful	Improvement claimed
Teaching programme:			
Stirling	97	80	87
Alternative	100	97	93
Technical feedback:			
Audiotape	97	87	94
Videotape	100	90	86
Inter-personal feedback:			
Tutor present	97	81	90
Tutor absent	100	97	90

Statement of behaviour 9:

To ask questions designed to help pupils achieve goals other than memorization of knowledge.

Teaching programme:			
Stirling	100	83	77
Alternative	97	83	83
Technical feedback:			
Audiotape	100	87	74
Videotape	97	79	86
Inter-personal feedback:			
Tutor present	100	77	77
Tutor absent	97	90	83

Table 88 (continued)

Statement of behaviour 10:

To ask questions designed to encourage the pupil to apply a known idea to a new situation.

Treatment group	Percentage responding YES		
	Objective valuable	Programme helpful	Improvement claimed
Teaching programme:			
Stirling	100	77	67
Alternative	97	70	60
Technical feedback:			
Audiotape	97	61	61
Videotape	100	86	66
Inter-personal feedback:			
Tutor present	97	68	74
Tutor absent	100	79	52

Statement of behaviour 11:

To ask questions to encourage the pupil to organize or use ideas encountered in familiar contexts.

Teaching programme:			
Stirling	90	63	63
Alternative	93	57	60
Technical feedback:			
Audiotape	87	45	58
Videotape	97	76	66
Inter-personal feedback:			
Tutor present	87	68	65
Tutor absent	97	52	59

Table 88 (continued)

Statement of behaviour 12:

To ask questions designed to encourage the pupil to analyze a problem or situation.

Treatment group	Percentage responding YES		
	Objective valuable	Programme helpful	Improvement claimed
Teaching programme:			
Stirling	100	90	83
Alternative	100	93	90
Technical feedback:			
Audiotape	100	94	87
Videotape	100	90	86
Inter-personal feedback:			
Tutor present	100	87	87
Tutor absent	100	97	86

Statement of behaviour 13:

To give notice to a pupil of an impending question.

Teaching programme:			
Stirling	47	20	10
Alternative	30	20	10
Technical feedback:			
Audiotape	42	19	10
Videotape	34	21	10
Inter-personal feedback:			
Tutor present	23	10	7
Tutor absent	55	31	14

Table 88 (continued)

Statement of behaviour 14:

To offer some clue, or ask a question in a restructured form, when the pupil does not respond to an initial question.

Treatment group	Percentage responding YES		
	Objective valuable	Programme helpful	Improvement claimed
Teaching programme:			
Stirling	93	80	83
Alternative	97	57	83
Technical feedback:			
Audiotape	97	68	87
Videotape	93	69	79
Inter-personal feedback:			
Tutor present	97	68	84
Tutor absent	93	69	83

Statement of behaviour 15:

To ask questions which seek to develop the pupils' ability in general skills of thinking.

Teaching programme:			
Stirling	93	70	63
Alternative	93	77	70
Technical feedback:			
Audiotape	97	81	65
Videotape	90	66	69
Inter-personal feedback:			
Tutor present	90	61	55
Tutor absent	97	86	79

Table 88 (continued)

Statement of behaviour 16:

To pay attention to individual pupil responses.

Treatment group	Percentage responding YES		
	Objective valuable	Programme helpful	Improvement claimed
Teaching programme:			
Stirling	97	77	93
Alternative	97	70	80
Technical feedback:			
Audiotape	94	65	84
Videotape	100	83	90
Inter-personal feedback:			
Tutor present	94	71	84
Tutor absent	100	76	90

Statement of behaviour 17:

To engage all members of the class in the lesson.

Teaching programme:			
Stirling	93	80	80
Alternative	97	67	77
Technical feedback:			
Audiotape	90	71	81
Videotape	100	76	76
Inter-personal feedback:			
Tutor present	94	68	74
Tutor absent	97	79	83

Table 88 (continued)

Statement of behaviour 18:

To ask questions designed to encourage pupils to break down material into constituent parts, and to detect the relationship of the parts and the way they are organized.

Treatment group	Percentage responding YES		
	Objective valuable	Programme helpful	Improvement claimed
Teaching programme:			
Stirling	90	50	47
Alternative	93	77	53
Technical feedback:			
Audiotape	87	68	52
Videotape	97	59	48
Inter-personal feedback:			
Tutor present	94	61	48
Tutor absent	90	66	52

Statement of behaviour 19:

To ask questions which encourage the pupil to exemplify a given idea, to justify a conclusion, or to outline criteria for an expressed opinion.

Teaching programme:			
Stirling	100	77	83
Alternative	97	80	86
Technical feedback:			
Audiotape	100	84	94
Videotape	97	72	69
Inter-personal feedback:			
Tutor present	100	84	90
Tutor absent	97	72	72

Table 88 (continued)

Statement of behaviour 20:

To ask questions which encourage pupils to contribute information concerning their acquired knowledge, experience, interests, and attitudes.

Treatment group	Percentage responding YES		
	Objective valuable	Programme helpful	Improvement claimed
Teaching programme:			
Stirling	97	73	80
Alternative	100	70	73
Technical feedback:			
Audiotape	100	68	71
Videotape	97	76	83
Inter-personal feedback:			
Tutor present	100	65	68
Tutor absent	97	79	86

Statement of behaviour 21:

To structure questions which already indicate to the pupils the sort of answer required.

Teaching programme:			
Stirling	27	30	30
Alternative	43	33	33
Technical feedback:			
Audiotape	39	42	42
Videotape	31	21	21
Inter-personal feedback:			
Tutor present	35	31	29
Tutor absent	34	31	34

Discussion of Results

Responses to statements 6, 13, and 21 (unconnected with programme objectives) fulfilled expectations. The positive responses from the experimental groups on the three criteria were in most cases less than 35 percent. Positive responses of the groups to the other eighteen statements (those connected with programme objectives) were in most cases more than 65 percent.

Of the three criteria offered for assessment of the behaviours described in the statements, the first - the value of the objective for classroom teaching - received the highest percentage of positive responses. In all but six of the 108 group responses on this criterion, the percentage of positive responses was 90 percent or more.

While it was apparent that students were almost unanimous in their support for the teaching principles underlying the statements, their opinions were more divergent about the implementation of these principles in the programme structure and in their own performance. The abilities for which students found the programme most helpful were those contained in statements 7 (comprehension questions), 9 (higher order questions), 12 (analysis questions), 8 and 19 (probes). These were also the abilities in which students felt their performance had most improved, in addition to the behaviours described in statements 14 (prompts), 16 (pupil responses), and 20 (knowledge questions). The statements about analysis and higher order questions, probes, and prompts all concerned central aims of the programme, so it would be expected that, if the programme was successful, students would find that these were the areas in which they found the programme structure most helpful and made most improvement.

The behaviours for which students found the programme least helpful and in which they felt they made least improvement (although still averaging about 50 percent of positive responses for both criteria) were those contained in statements 1 (application questions), 3 (pupil background), 4 (pupil achievement), 11 (comprehension questions), and 18 (analysis questions). The lack of conviction about the behaviour "application questions" noted in the responses might well be related to the very low frequency of occurrence of this behaviour in microteaching lessons. The difficulties experienced by students in practising this skill probably reflected the time constraints of microteaching sessions and a degree of uncertainty regarding the class members' background knowledge and experience.

The general abilities referred to in statements 3 and 4 reflected the introductory section rather than the core part of the programme, and therefore would not be expected to score well on the criteria. It was more difficult to explain the relatively low positive response of students to statements 11 and 18 on comprehension and analysis questions, particularly as the companion statements on the same question types (statements 7 and 12) were rated highly by students. The difference in response to the statements on analysis questions could perhaps result from the wording of the statement - the more highly rated statement was simply phrased and contained the cue word "analyze". Perhaps the use of the word "organize" in statements 11 and 18 suggested to students a degree of complexity in the behaviour that they had not encountered.

Further trends were evident in a consideration of the responses made by the different treatment groups. Looking at differences of about 25 percent between the positive responses of two groups, statements 1 and 10 (application questions) were given higher support by group members with tutors than without tutors, and by members of treatment groups given videotape rather than audiotape feedback. In general, when there were differences between the responses of the feedback groups, there was no discernable pattern with the inter-personal feedback variants, but with the technical feedback variants there was a tendency for differences to favour videotape feedback rather than audiotape feedback.

There were four statements which elicited markedly different responses from the Stirling and Alternative programme groups. More students following the Stirling programme felt the teaching programme had helped them and improvement had been achieved in the behaviours contained in statements 3 (pupil background) and 14 (prompts). Both these statements were in the printed notes given to Stirling programme students only. More students following the Alternative course reported help and improvement in the behaviours described in statements 5 (synthesis questions) and 18 (analysis questions). Both these statements followed closely the description of those question categories given by Bloom et al., (1956), which was used frequently and deliberately in the Alternative programme, but only referred to in passing in the Stirling programme.

Section Two

The second section of the questionnaire was concerned with specific parts of the microteaching component of the programme. Twenty-two questions were asked, of which twenty were multiple-choice and two were open-ended. Space was allowed at the end of each question for student comment or explanation of the criteria employed by them in making their response, and the last page of the questionnaire invited further general comments.

Responses to all questions were classified according to the treatment groups (the complete tabulation of responses to the multiple-choice questions was included in Appendix D). To determine the measure of association between data groups, chi-square analyses (Guilford, 1965, p.240) and Kolmogorov-Smirnov two-sample tests (Siegel, 1956, p.127) were applied to the group results for the independent variables teaching programme (Stirling/Alternative), technical feedback (replay by audiotape/videotape), and inter-personal feedback (tutor present/absent).

The Kolmogorov-Smirnov two-tailed test was applied to those questions which required students to select a rating from a four- or five-point continuum (e.g., questions 3, 10, 12); a chi-square analysis was applied to those questions which allowed students to select more than one response from a list of independent alternatives (e.g., questions 2, 7, 8, 9). Some questions (e.g., question 1) contained a rating "not applicable". This was included for administrative reasons, in order that the same questionnaire could be given to all students. It was expected that questions referring to elements of one particular teaching programme would be scored as "not applicable" by students taking the other programme. A small percentage of

responses, less than one percent, were erroneously placed in this category by students. Observation of the data indicated that these responses were spread across the treatment groups and therefore, because the purpose of this category was not to provide information, it was excluded from the statistical analyses of results.

In the discussion of responses which follows, the questions have been grouped into seven categories, covering different aspects of the microteaching programme. The question-groups have been labelled as follows:

- (a) characteristics of the teaching programme (questions 1, 2, 3, 12):
- (b) planning for the "teach" session (questions 4, 5):
- (c) attention to behaviours in microteaching lessons (questions 6, 7):
- (d) replay session (questions 8, 9, 10, 11);
- (e) function of the tutor in the replay session (questions 13, 14, 15, 16);
- (f) "reteach" session (questions 17, 18, 19, 20);
- (d) value of the microteaching experience (questions 21, 22).

Tables of responses (Tables 89 - 95) and discussions of results are presented for each group of questions. Included in the discussion are statistically significant results, trends evident in the tabulated data, and summaries of comments. Where responses to the open-ended question 23 dealt with issues raised by other questions, these comments have been included amongst those concerned with the specific issues.

Table 89

Data for Questions Concerned with the
Characteristics of the Teaching Programme

Question 1:

It may be suggested that the 'printed handouts' received at lectures (Stirling or Alternative programme) serve several purposes.

How valuable have you found these handouts in the following respects?

- (a) Clear definition of the particular behaviours to be practised

	Percentage response (n = 60)					
	Teaching programme		Technical feedback		Inter-personal feedback	
	Stirling	Alternative	Audiotape	Videotape	Staff tutor present	Staff tutor absent
(i) Very valuable	40	63	52	52	55	48
(ii) Fairly valuable	57	37	48	45	45	48
(iii) Not very valuable	3	0	0	3	0	3
(iv) Not at all valuable	0	0	0	0	0	0

Table 89 (continued)

(e) Provision of written transcripts of "model" lessons giving examples of the use of the behaviour in the classroom

		Percentage response (n = 60)					
		Teaching Programme		Technical feedback		Interpersonal feedback	
		Stirling	Alternative	Audiotape	Videotape	Staff tutor present	Staff tutor absent
(i)	Very valuable	17	43	19	41	35	24
(ii)	Fairly valuable	40	37	42	34	42	34
(iii)	Not very valuable	17	13	13	17	6	24
(iv)	Not at all valuable	7	7	10	3	10	3

Question 2:

(You may underline more than one response)

Many of the questioning behaviours were specified in close association with the categories of Bloom's "Taxonomy of Educational Objectives", i.e. knowledge, comprehension, application, analysis, synthesis.

	Percentage response (n = 60)					
	Teaching Programme		Technical feedback		Interpersonal feedback	
	Stirling	Alternative	Audiotape	Videotape	Staff tutor present	Staff tutor absent
This approach						
(i) provided a clarification of ideas concerning the behaviour	43	80	71	52	65	59
(ii) introduced an unrealistic element regarding application to the classroom	33	30	29	34	23	41
(iii) provided neither a positive nor a negative impetus to the study	10	3	6	7	6	7
(iv) assisted in establishing the purpose and relevance of the behaviour	50	73	58	66	71	52
(v) dissected the ideas to the extent that the concept of teaching was lost	17	7	13	10	10	14

Table 89 (continued)

(b) Explanation of the relevance and purposes of the behaviour
in teaching

		Percentage response (n = 60)					
		Teaching Programme		Technical feedback		Inter-personal feedback	
		Stirling	Alternative	Audiotape	Videotape	Staff tutor present	Staff tutor absent
(i)	Very valuable	20	17	19	17	16	21
(ii)	Fairly valuable	70	67	61	76	68	69
(iii)	Not very valuable	7	17	16	7	13	10
(iv)	Not at all valuable	3	0	3	0	3	0

(c) Practice, on written examples, in identifying the behaviour

(i)	Very valuable	27	40	29	38	26	41
(ii)	Fairly valuable	43	40	52	31	48	34
(iii)	Not very valuable	20	20	10	31	19	21
(iv)	Not at all valuable	3	0	3	0	3	0

(d) Practice, based on stimulus material, in writing examples of
the particular behaviour

(i)	Very valuable	3	30	16	17	13	21
(ii)	Fairly valuable	30	43	35	38	35	38
(iii)	Not very valuable	50	23	35	38	42	31
(iv)	Not at all valuable	0	3	0	3	3	0

Table 89 (continued)

Question 3:

How helpful to you were the films or videotapes of "model" lessons in clarifying your ideas of the various abilities in a variety of classroom situations?

	Percentage response (n = 60)					
	Teaching Programme		Technical feedback		Interpersonal feedback	
	Stirling	Alternative	Audiotape	Videotape	Staff tutor present	Staff tutor absent
(i) Very helpful	63	30	48	45	39	55
(ii) Fairly helpful	27	43	26	45	45	24
(iii) Not very helpful	10	20	19	10	16	14
(iv) Not at all helpful	0	7	7	0	0	7

Question 12:

The evaluation instruments (sheets) were designed to help you plan and assess your microteaching, and to focus your attention upon the behaviours being practised before the teach lesson and during the replay session. In this regard, how useful to you were these instruments?

(i) Very useful	20	10	19	10	13	17
(ii) Fairly useful	13	45	26	31	23	34
(iii) Not very useful	27	40	39	28	42	24
(iv) Not at all useful	40	7	16	31	23	24

Discussion of Results

Question 1: Printed handouts

Students indicated that they found all five aspects listed to be of value to them - three-quarters of the respondents rated the aspects as "very valuable" or "valuable". Overall, the rating patterns of students in the Stirling and Alternative programmes were similar, except in the "very valuable" category which elicited responses from almost twice as many Alternative as Stirling students.

As was to be anticipated, application of the Kolmogorov-Smirnov test revealed that the responses of students in the two programmes were significantly different for the fourth aspect "practice in writing examples of the behaviour" ($KD = 12, P \leq .05$). This behaviour could occur only incidentally during lesson planning and tutorials for the Stirling students, whilst it was a deliberate part of the programme for Alternative programme students.

Question 2: Association of behaviours with Bloom's taxonomy

Two positive, one neutral, and two negative statements were listed for students to check agreement. A chi-square analysis was applied to the responses to each statement, producing a significant result for response (i) "clarification of ideas" - more Alternative than Stirling students agreed with this statement ($\chi^2 = 7.05, P \leq .01, df 1$). There was also a higher response rate from Alternative students to the other positive statement (iv) "establishing the purpose and relevance of the behaviour", although the difference was not statistically significant.

The total responses to the positive statements (i and iv) were much higher than the responses to the negative (ii and v) and neutral (iii) statements.

Question 3: Helpfulness of films/videotapes

Stirling students appeared to find the films or videotapes more helpful than did Alternative students, although both groups responded positively to this question. Students were asked to outline the criteria for their answers, and the comments from the two groups were slightly different. The advantages of the films according to Stirling students were that they consolidated the ideas presented in lectures, and that they provided a bridge between theory and practice because a realistic view of the classroom situation was presented; to Alternative students, the films' advantages were that they clarified and demonstrated skill categories. Criticisms expressed by Alternative students were that the American context was not applicable to teaching in Scotland, and that the sessions were obviously rehearsed.

Question 12: Usefulness of evaluation sheets

Observation of the tabulated data revealed a difference in the responses of the two groups to this question - for the Stirling group the highest response frequency was in the "not at all useful" category, while for the Alternative group the highest response frequency was in the "fairly useful" category. The few comments that were made by students tended to support these trends. Alternative students found the evaluation sheets useful guidelines for planning, while Stirling students found them irrelevant. Several students from both groups experienced

difficulty in concentrating on the replay and using the evaluation sheets at the same time. The differing responses of the experimental groups with and without tutors showed that the evaluation sheets were more useful to those students without tutors.

Table 90

Data for Questions Concerned with
Planning for the "Teach" Session

Question 4:

In planning your teach session, what proportion of your time was spent thinking about what you would discuss with the pupils (subject matter), and what proportion on the characteristics of the specific questions you intended to ask the pupils?

	Percentage response (n = 60)					
	Teaching programme		Technical feedback		Interpersonal feedback	
	Stirling	Alternative	Audiotape	Videotape	Staff tutor present	Staff tutor absent
(i) Most time given to subject matter	37	43	29	52	29	52
(ii) About the same time on each	33	30	39	24	35	28
(iii) Most time given to specific questions	30	27	32	24	35	21

Table 90 (continued)

Question 5:

What period of time did you spend planning for your teach session?

	Percentage response (n = 600)					
	Teaching programme		Technical feedback		Interpersonal feedback	
	Stirling	Alternative	Audiotape	Videotape	Staff tutor present	Staff tutor absent
(i) Approx. ½ hour	33	27	23	38	26	34
(ii) Approx. 1 hour	20	40	26	34	42	17
(iii) Approx. 1½ hours	20	23	32	10	19	24
(iv) Approx. 2 hours	17	7	16	7	10	14
(v) Approx. 3 hours	3	0	3	0	0	3
(vi) 3 hours or more	7	3	0	10	3	7

Discussion of resultsQuestions 4, 5: Planning

Student responses to the questions on preparation time showed that, on average, just over an hour was spent in planning the teach session, and a slightly higher percentage of students devoted more time to subject matter than to specific questions or equal time on both. The few comments made on the question indicated that the actual choice of subject matter was the most time-consuming factor in planning.

Table 91

Data for Questions Concerned with Attention
to Behaviours in Microteaching Lessons

Question 6:

During your microteaching lessons did you have difficulty
in focussing your attention upon the abilities you
were practising?

	Percentage response (n = 60)					
	Teaching programme		Technical feedback		Interpersonal feedback	
	Stirling	Alternative	Audiotape	Videotape	Staff tutor present	Staff tutor absent
(i) Yes	67	70	74	62	68	69
(ii) No	33	30	26	38	32	31

Table 91 (continued)

Question 7:

If your answer to question 6 was YES, which of the following contributed significantly to this difficulty?

(You may underline more than one response.)

	Percentage response (n = 41)					
	Teaching Programme		Technical feedback		Interpersonal feedback	
	Stirling	Alternative	Audiotape	Videotape	Staff tutor present	Staff tutor absent
(i) You did not have a clear idea of the behaviour to be practised.	25	0	4	22	10	15
(ii) The behaviour could not be separated from the other aspects of your teaching.	65	52	52	67	62	55
(iii) You were distracted by the feeling of being observed.	10	5	13	0	10	5
(iv) The short lesson prevented the development of your attempt to practise the behaviour.	50	81	73	56	62	70
(v) The response of the pupils was disheartening.	15	24	22	17	14	25
(vi) The subject matter chosen was inappropriate for the behaviour practised.	10	29	22	17	10	30
(vii) The responses of the pupils led the discussion into other fields.	50	43	35	61	48	45

Table 91 (continued)

Question 7: (continued)

	Percentage response (n = 41)					
	Teaching Programme		Technical feedback		Interpersonal feedback	
	Stirling	Alternative	Audiotape	Videotape	Staff tutor present	Staff tutor absent
(viii) You had misleading perceptions about the abilities or previous knowledge of the pupils	20	29	26	22	45	5
(ix) Other reasons	25	5	13	17	25	5

Discussion of resultsQuestions 6, 7: Attention to behaviours in microteaching lesson

Two-thirds of the students found difficulty in focussing attention on the behaviours to be practised in the micro-teaching lessons. The principal types of difficulties experienced were: the behaviour could not be separated from other aspects of teaching; the time was too short to practice the behaviours properly (this particularly applied to Alternative students); and pupils' responses led discussion into other fields. These were also the factors mentioned most frequently in students' comments on these questions. Additional difficulties mentioned were that the taxonomical approach inhibited the flow of the lesson, and that there was insufficient time to establish pupil interests before beginning to practise higher order questioning skills.

Table 92

Data for Questions Concerned with the Replay

Session

Question 8:

(You may underline more than one response.)

Which of the following describe the procedure adopted during the replay session?

	Percentage response (n = 60)					
	Teaching Programme		Technical feedback		Interpersonal feedback	
	Stirling	Alternative	Audiotape	Videotape	Staff tutor present	Staff tutor absent
(i) Actual replay proceeds with little or no comment.	33	30	39	24	26	38
(ii) Aspects of the lesson are discussed as they occur.	37	30	29	38	58	7
(iii) Staff tutor uses evaluation sheet.	53	37	48	41	77	10
(iv) Student uses evaluation sheet.	43	53	58	38	35	62
(v) Staff tutor notes points for subsequent discussion.	50	47	42	55	81	14
(vi) Student notes points for subsequent discussion.	40	37	35	41	42	34

Table 92 (continued)

Question 9:

(You may underline more than one response.)

Irrespective of whether a replay session occurred in the presence of a staff tutor or a self-evaluation approach was taken, significant aspects of appraisal during or following the replay of the lesson concerned. . . .

	Percentage response (n = 60)					
	Teaching Programme		Technical feedback		Interpersonal feedback	
	Stirling	Alternative	Audiotape	Videotape	Staff tutor present	Staff tutor absent
(i) the "strengths" (appropriate behaviour) of the lesson	63	70	74	59	77	55
(ii) the "weaknesses" (inappropriate behaviour) of the lesson	90	90	94	86	94	86
(iii) subject matter (content).	37	30	26	41	48	17
(iv) questioning abilities	77	73	74	76	74	76
(v) other teaching activities	30	30	23	38	19	41
(vi) planning the reteach lesson	60	50	52	59	65	45

Table 92 (continued)

Question 10:

Irrespective of whether your replay sessions centred around an audio only recording, or a videotape recording was available, indicate your degree of satisfaction with the replay session.

		Percentage response (n = 60)					
		Teaching programme		Technical feedback		Interpersonal feedback	
		Stirling	Alternative	Audiotape	Videotape	Staff tutor present	Staff tutor absent
(i)	Completely satisfactory	13	20	13	21	32	0
(ii)	Quite satisfactory	63	67	65	66	65	66
(iii)	Barely satisfactory	10	10	10	10	0	21
(iv)	Unsatisfactory	13	3	13	3	3	14

Table 92 (continued)

Question 11:

(You may underline more than one response.)

If your answer to question 10 was (ii), (iii), or (iv),
which of the following factors contributed significantly
to the lack of satisfaction?

	Percentage Response (n = 50)					
	Teaching programme		Technical feedback		Interpersonal feedback	
	Stirling	Alternative	Audiotape	Videotape	Staff tutor present	Staff tutor absent
(i) Lack of staff tutor	46	67	48	65	14	86
(ii) Videotape recording required	50	21	59	9	48	28
(iii) Manner in which replay session was conducted	12	8	4	17	10	10
(iv) recording unable to highlight the behaviours being practised	23	8	19	13	19	14
(v) Inability to view, or insufficient concentration upon, teacher behaviours	19	21	30	9	24	17
(vi) Inability to view, or insufficient concentration upon, pupil behaviour	8	21	15	13	19	10
(vii) Technical quality of the recording	4	0	4	0	4	0
(viii) Other	4	17	4	17	19	3

Discussion of resultsQuestion 8:

The nature of the replay session was not affected by the type of programme or technical feedback experienced by the students. As would be expected, for those response alternatives involving tutors ((iii) and (v)), there was a significant difference in the responses of groups with and without tutors. The total responses were spread fairly evenly across the six alternatives, with a slightly higher frequency of response to statements concerning tutor/student use of the evaluation sheet and tutor noting points for further discussion.

Question 9:

There was a greater variation in the responses to the statements concerning the methods employed during the replay session. Most attention was given to lesson weaknesses, followed by questioning behaviours, lesson strengths, and planning the reteach lesson. There was a significant difference in the response of the inter-personal feedback groups to the aspect of subject matter ($\chi^2 = 5.2, p \leq .05, df = 1$). This aspect was given far more attention by the group with a tutor than the group without one, and this difference stems from the responses of the Alternative rather than the Stirling programme students.

Questions 10, 11:

Most students found the replay sessions "quite satisfactory" (65 percent) or "completely satisfactory" (17 percent). There was a tendency for students with a tutor to be more satisfied than students without a tutor. The principal reasons given for lack of satisfaction with the replay session were the lack of a staff tutor and the need for a videotape replay. As might be anticipated, there were significant differences in the responses to the former alternative by the interpersonal feedback groups ($\chi^2 = 13.1, p \leq .001, df = 1$), and to the latter alternative by the technical feedback groups ($\chi^2 = 15.1, p \leq .001, df = 1$). There was also a greater tendency for students in the Stirling programme to express a need for a videotape recording than students in the Alternative programme. Student comments on these questions tended to centre on technical feedback procedures. Videotape was preferred by some students because it gave a more realistic impression of the total classroom situation, in particular non-verbal behaviour. Other students (all from the Alternative programme) expressed a preference for audiotape feedback, because it enabled students to concentrate on skills behaviour and ignore cosmetic distractions. Some students felt that insufficient time was available in the replay sessions to employ adequate evaluation procedures.

Table 93

Data for Questions Concerned with the Function
of the Staff Tutor in the Replay Session

(These questions were answered by students provided
with staff tutors.)

Question 13:

(You may underline more than one alternative.)

Just prior to your audio only or videotape replay, and in
association with your staff tutor

		Percentage response (n = 31)			
		Teaching programme		Technical feedback	
		Stirling	Alternative	Audiotape	Videotape
(i)	You almost immediately asked for the replay.	20	13	25	7
(ii)	You exchanged comments designed to set each other at ease.	53	56	28	60
(iii)	You made a general, overall appraisal of the lesson.	53	75	56	73
(iv)	You clarified the objectives of the lesson.	14	19	13	20
(v)	You clarified some details of subject matter.	14	25	6	33
(vi)	You made specific comments designed to focus attention on certain aspects of the replay.	47	38	31	53

Table 93 (continued)

Question 14:

The direction (who said what, when) of the replay session was in the hands of

	Percentage response (n = 31)			
	Teaching programme		Technical feedback	
	Stirling	Alternative	Audiotape	Videotape
(i) the staff tutor.	0	6	6	0
(ii) the staff tutor, mainly.	43	31	25	47
(iii) both staff tutor and student.	53	63	63	53
(iv) the student, mainly.	7	0	6	0
(v) the student.	0	0	0	0

Question 15:

(Choose one response from each of (a), (b) and (c).)

You found your staff tutor's comments to be

(a) (i) specific.	73	88	88	73
(ii) general.	27	6	12	21
(b) (i) critical and negative.	0	0	0	0
(ii) neutral.	0	13	13	0
(iii) reassuring.	40	19	38	20
(iv) encouraging.	60	69	50	80
(c) (i) very helpful.	67	63	50	80
(ii) fairly helpful.	27	31	38	20
(iii) not very helpful.	7	6	13	0
(iv) not at all helpful.	0	0	0	0

Discussion of resultsQuestions 13, 14, 15, 16: Function of staff tutor in replay session

These questions were answered only by those students who were provided with staff tutors. The procedures most frequently used by tutors before the replay were an overall appraisal, an exchange of informal comments, and specific skill-focussed comments. The direction of the replay session in nearly every case was either in the hands of both the tutor and the student, or mainly the tutor. Students reacted very positively to tutors' comments - 65 percent found them encouraging and very helpful, and no student chose the alternatives "not at all helpful" or "critical and negative". Students in the technical feedback group receiving videotape replays tended to find tutors' comments more helpful and encouraging than students receiving audiotape replays. Students indicated that the tutors' comments were specific rather than general. Additional statements made by students about tutors indicated that they were helpful because they emphasized strengths rather than weaknesses, had a calming effect on the student, and set a pattern of approach to evaluation that could be followed by the student in later sessions.

Question 16 asked for suggestions about how tutors' comments could be more helpful. The two suggestions that were made most frequently were that comments should be more analytical, and that the tutor should encourage the student to state his objectives and justify his behaviour.

Table 94

Data for Questions Concerned with the "Reteach"

Session

Question 17:

What period of time did you spend in planning your reteach lesson?

	Percentage response (n = 60)					
	Teaching Programme		Technical feedback		Interpersonal feedback	
	Stirling	Alternative	Audiotape	Videotape	Staff tutor present	Staff tutor absent
(i) Approx. $\frac{1}{4}$ hour	40	67	45	62	52	55
(ii) Approx. $\frac{1}{2}$ hour	43	30	39	34	42	31
(iii) Approx. $\frac{3}{4}$ hour	10	0	10	0	3	7
(iv) Approx. 1 hour	3	0	3	0	0	3
(v) Approx. $1\frac{1}{2}$ hours	3	3	3	3	3	3
(vi) More than 2 hours	0	0	0	0	0	0

Table 94 (continued)

Question 18:

(You may underline more than one alternative.)

The reteach lesson

	Percentage response (n = 60)					
	Teaching Programme		Technical feedback		Interpersonal feedback	
	Stirling	Alternative	Audiotape	Videotape	Staff tutor present	Staff tutor absent
(i) followed lines very similar to the teach lesson.	20	17	16	21	16	21
(ii) practised, and attempted to improve upon the "weaknesses" revealed in the teach lesson.	57	63	55	66	61	59
(iii) deliberately followed a different approach.	3	3	6	0	6	0
(iv) attempted to follow-up the staff tutor's suggestions.	43	33	39	38	61	14
(v) followed lines very similar to the teach lesson, different pupils providing a new experience.	30	57	35	52	32	55

Table 94 (continued)

Question 19:

How valuable was it to take part in a reteach lesson?

	Percentage response (n = 60)					
	Teaching Programme		Technical feedback		Interpersonal feedback	
	Stirling	Alternative	Audiotape	Videotape	Staff tutor present	Staff tutor absent
(i) Very valuable	37	27	32	31	32	31
(ii) Fairly valuable	43	47	42	48	32	59
(iii) Not very valuable	13	27	23	17	29	10
(iv) Not at all valuable	7	0	3	3	6	0

Question 20:How necessary do you regard the provision of a staff tutor for the reteach lesson?

(i) Essential	23	7	10	21	19	10
(ii) Useful	30	43	48	24	39	34
(iii) Dependent upon performance in teach lesson	33	37	29	41	35	34
(iv) Unnecessary	13	13	13	14	6	21

Discussion of resultsQuestions 17, 18, 19, 20: Reteach session

Most students spent between one quarter-hour and one half-hour planning their reteach session. Slightly less time was devoted to planning by Alternative students than by Stirling students, in contrast to time spent in planning the teach session. Responses showed that students mainly attempted in the reteach lesson to improve upon weaknesses and to follow up tutors' suggestions. It was also indicated that for many students the reteach lesson followed lines similar to the teach lesson, with the different group of pupils providing the variation. (The Alternative group placed greater emphasis on this aspect than the Stirling group.) The consensus of student opinion was that the reteach sessions were fairly valuable. Some students suggested in their comments that they found it interesting to observe different pupil responses to the same lesson, although other students felt that the very difference in pupil reactions turned it into a second teach rather than a reteach lesson. Question 20 asked students to rate on a four-point scale the importance of a tutor in the reteach lesson. The median point in the responses fell between the second and third points on the scale - "useful", and "dependent upon performance in the teach lesson". Neither the total group in general nor the sub-group with no tutor in particular regarded the presence of the tutor to be as necessary in the reteach as in the teach lesson.

Table 95

Data for Questions Concerned with the Value
of the Microteaching Experience

Question 21:

The total teaching programme was made up of lectures, curriculum and theory seminars as well as the provision of microteaching experiences.

Do you regard the provision of the microteaching component to be

	Percentage response (n = 60)					
	Teaching Programme		Technical feedback		Interpersonal feedback	
	Stirling	Alternative	Audiotape	Videotape	Staff tutor present	Staff tutor absent
(i) Worthwhile	100	100	100	100	100	100
(ii) Not worthwhile	0	0	0	0	0	0

Discussion of resultsQuestions 21, 22: Value of the microteaching experience

Students were unanimous in their opinion that the microteaching component of the total teaching programme was worthwhile. They were asked to state the criteria on which they based this judgement. Two criteria were mentioned by most of the students. One was that the microteaching lessons provided an introduction or transition to the reality of the classroom situation, and contact experience with children; the other was that the lessons

provided an opportunity to put the theory presented in the lectures into practice, and gave an insight into specific teaching skills. Three other criteria were mentioned by a smaller number of students: the microteaching lessons enabled them to assess their own potential as teachers, and encouraged self-evaluation; the experience helped them to develop self-confidence; and, quite simply, it was an enjoyable, stimulating experience.

QUESTIONNAIRE TO STAFF TUTORS

Seven staff members acted as tutors for students in the Autumn semester 1972. Each tutor was associated with several students from both the Stirling and the Alternative programmes.

Thirteen of the 16 questions making up the staff tutors' questionnaire paralleled the questions asked in Section Two of the student questionnaire. Except for the open-ended questions 8, 10, 14, and 17, staff were asked to consider their responses separately for the Stirling programme and for the Alternative programme. In three questions, question 2 (link between questioning behaviours and Bloom's taxonomy) and questions 4 and 5 (replay sessions), the staff tutor was invited to respond both from his own personal viewpoint and from his perception of the student's viewpoint.

All seven staff tutors completed the questionnaire. The small number of staff involved necessitated a departure from the method of presentation of results by percent; and in the paragraphs which follow, a statement of the question asked is followed by a discussion of the responses.

Question 1:

In the Education 13 course, some tutors have only a peripheral involvement in the details of the work undertaken. It is possible, therefore, that tutors depend upon the printed lecture handouts (Stirling and/or Alternative course) to clarify the course objectives and the behaviour expected from students taking the programme.

How valuable have you found these handouts in the following respects?

- (a) clear definition of the particular behaviours to be practised;
- (b) explanation of the relevance and purposes of the behaviour in teaching;
- (c) provision of practice for the students, using written examples, in identifying the behaviour,

- (d) provision of practice for the students, based on stimulus material, in writing examples of the particular behaviour;
- (e) provision for the students of written transcripts of "model" lessons giving examples of the use of the behaviour in the classroom.

The staff tutor was asked to rate each of the above items on the following scale:

- (i) very valuable
- (ii) fairly valuable
- (iii) not very valuable
- (iv) not at all valuable
- (v) not applicable
- (vi) no comment
- (vii) other (please specify).

Questionnaire responses showed that staff tutors, like students, found the printed handouts to be of considerable value, particularly in the first listed aspect, "clear definition of behaviours to be practised".

The trend noted in student responses for Alternative programme students to find the handouts more valuable than Stirling programme students was strongly reinforced by staff tutors. The tutors clearly felt the Alternative programme materials preferable to Stirling material in respects (a) and (b), and in also rating highly (c), (d), and (e)-which only applied to the Alternative materials-they indicated that such procedures should be introduced into the Stirling programme.

Question 2:

(You may select more than one alternative.)

Many of the questioning behaviours were specified in close association with the categories of Bloom's "Taxonomy of Educational Objectives", i.e. knowledge, comprehension, application, analysis, synthesis.

- (a) For the STUDENTS, it would be your opinion that this approach . . .
- (b) For YOU, the TUTOR, this approach . . .
 - (i) provided a clarification of ideas concerning the behaviour.
 - (ii) introduced an unrealistic element regarding application to the classroom.
 - (iii) provided neither a positive nor a negative influence.
 - (iv) assisted in establishing the purpose and relevance of the behaviour.
 - (v) dissected the ideas to the extent that the concept of teaching was lost.
 - (vi) other (please specify).

Staff tutors, like students, gave much stronger support to the positive statements ((i) and (iv)) than to the negative ((ii) and (v)) and neutral (iii) statements. Tutors' responses to the five statements were much the same whether they were speaking on their own behalf or offering their perception of the student viewpoint. They felt that the first statement, concerning clarification of ideas, was more apparent in the Alternative programme than in the Stirling programme - and three of the four tutors who ticked both programmes commented that they would rate the Alternative programme higher in this regard. One tutor went on to say that this high rating could possibly lead to the introduction of an unrealistic element (statement (ii)) because of the restrictive interpretation imposed on the categories. Another comment was that the advantages

of the approach would have been heightened if a systematic interpretation of each category had been made in relation to the full range of teaching subjects.

Question 3:

In preparation for the replay session with the students, what proportion of your planning time was spent on a general reading of the "printed handouts" to clarify the aims of the "teach" session, and what proportion on a study of the assessment schedule appropriate to the behaviour being practised?

- (i) most time given to general reading of "printed handouts"
- (ii) about the same time on each
- (iii) most time given to a study of the assessment schedule

For both Stirling and Alternative programmes, staff tutors clearly spent more time on general reading of printed handouts than on a study of assessment schedules.

Question 4:

(a) During microteaching sessions did the STUDENTS experience difficulty in focussing attention upon the behaviour being practised?

- (i) never
- (ii) rarely
- (iii) sometimes
- (iv) frequently
- (v) always

(b) During microteaching sessions did YOU experience difficulty in focussing attention upon the behaviours being practised?

- (i) never
- (ii) rarely
- (iii) sometimes
- (iv) frequently
- (v) always

Question 5:

(You may select more than one alternative.)

If your answer to question 4 was (ii), (iii), (iv) or (v), which of the following contributed significantly to this difficulty?

- (i) Behaviours were not clearly defined.
- (ii) Behaviours cited were of doubtful relevance to classroom teaching.
- (iii) You, as tutor, did not have a clear idea of the behaviour to be practised.
- (iv) The students did not appear to have a clear idea of the behaviour to be practised.
- (v) The students' notions of the behaviour to be practised needed realignment when considered against the "printed handout" statements.
- (vi) The behaviour could not be separated from other aspects of teaching.
- (vii) The time available for the lesson was too short to allow the students to practise the behaviours.
- (viii) Response of pupils failed to provide the students with a reasonable opportunity to practise the behaviours.
- (ix) The subject matter chosen by the student was inappropriate for the behaviour practised.
- (x) Other (please specify).

Most tutors indicated that they "rarely" or "sometimes" had difficulty in focussing upon the behaviours during the microteaching sessions, and that their students "sometimes" experienced difficulty. Responses for the two teaching programmes were almost the same. In the student questionnaire, two-thirds of the students indicated that they had experienced some difficulty in this regard.

In both questionnaires, respondents were asked to indicate which of a number of factors (many of them the same on both questionnaires) contributed to this difficulty. The two factors given the highest

rating on the student questionnaire were also accorded top rating on the staff tutor questionnaire: these factors were that the particular behaviour could not be separated from the other aspects of teaching (particularly from the point of view of the tutor) and that the lesson time was too short to practise the behaviours (speaking for the students). The latter factor was the highest rated response for Alternative programme students on both questionnaires. The other highly rated factor on the student questionnaire (that the difficulty stemmed from problems with pupil response) was given less support by tutors. The other highly rated factor on the staff tutor questionnaire, that students did not have a clear idea of the behaviour to be practised, did not rate so highly on the student questionnaire, but the two groups of responses had one thing in common - this factor was seen to be far more applicable to Stirling programme students than Alternative programme students.

Question 6:

(You may select more than one alternative.)
Which of the following describe the procedure adopted during replay sessions?

- (i) Actual replay proceeded with little or no comment.
- (ii) Aspects of the lesson were discussed as they occurred.
- (iii) You, as tutor, made use of the assessment schedule.
- (iv) Students used the assessment schedule.
- (v) You, as tutor, noted points for subsequent discussion.
- (vi) Students noted points for subsequent discussion.
- (vii) Other (please specify).

Question 7:

(You may select more than one alternative.)
Significant aspects of appraisal during or following the replay of the lesson concerned

- (i) the "strengths" (appropriate behaviour) of the lesson.
- (ii) the "weaknesses" (inappropriate behaviour) of the lesson.
- (iii) subject matter (content).
- (iv) questioning behaviours.
- (v) other teaching activities.
- (vi) planning the reteach lesson.
- (vii) other (please specify).

Staff tutors clearly saw the replay session procedures centring mainly on their own actions (particularly "staff tutor notes points for further discussion"), whereas the students felt they played almost as much a part in the procedures as the tutors. Staff and students were generally agreed on the aspects of appraisal emphasized in the replay session - lesson strengths and weaknesses, questioning behaviours, and planning the reteach lesson. Staff saw these four aspects as equal in prominence, but students felt that most emphasis was placed on lesson weaknesses.

Question 8:

Some replay sessions centred around an audio only recording; for others a videotape recording was available.

It would be helpful if you would make specific comment regarding any ways in which your approach to the replay session was affected by the use of either audiotape or the videotape record in the replay session.

These comments should apply only to the practice of the questioning behaviours.

Two of the seven staff tutors felt that the difference in types of recording did not affect their approach to the replay session.

Although two of them expressed a personal preference for videotape recording, the other five tutors found advantages and disadvantages in both types of recording which could affect the nature of the replay session.

It was stated several times that videotape was a more comprehensive replay tool because it provided more information. However, much of this additional information could be irrelevant to the practice of the behaviours and thus distracting to the tutor. The disadvantages of the audiotape recording were that the tutor had to rely on student reports of non-verbal behaviour, writing on the blackboard, and the identification of pupils. Also, some objectives of the Stirling course could not be assessed on audiotape, such as the involvement of all class members, and the distribution of questions across all students. Nevertheless it was felt that the audiotape enabled both tutor and student to focus on basic objectives and relevant behaviours without being side-tracked by other behaviours.

Question 9:

The assessment schedules were designed to focus attention upon the behaviours being practised before the teach lesson and during replay sessions.

In this regard, how useful to you were these instruments?

- (i) very useful
- (ii) fairly useful
- (iii) not very useful
- (iv) not at all useful
- (v) no comment
- (vi) other (please specify)

Both staff tutors and students felt that the Alternative programme evaluation sheets were more useful than the Stirling programme sheets, although the dichotomy was more marked in the student questionnaire responses. The two staff comments were polarized. One tutor found the Stirling programme sheets very useful for the less structured skills; the other tutor found them confusing.

Questions 10:

What advice, if any, would you suggest be given to students in order that maximum benefit be derived from the replay sessions?

In the student questionnaire, students suggested that tutors' comments in the replay session would be more helpful if they were more analytical, and if they encouraged the student to justify his teaching behaviour in terms of the objectives. Staff tutors agreed with the latter suggestion, but felt that the onus should be on the student to come to the replay session with a thorough understanding of the objectives and a grasp of the behaviour definition translated

into an explicit lesson plan, which would form the basis of the justification of behaviour in the teaching session. Tutors also suggested that students should make sure that they understood how to use the assessment schedule.

Question 11:

How valuable was it for the students to take part in a reteach lesson?

- (i) valuable for all students
- (ii) valuable for most students
- (iii) valuable for some students
- (iv) not valuable for any students
- (v) other (please specify)

Students seemed to have a higher regard for the reteach lesson than the staff tutors. In the student questionnaire, most students indicated that they found the reteach lesson "very valuable" or "fairly valuable", whereas in the staff tutor questionnaire, the median response point fell in the "valuable for some students" category. One tutor commented that the value to be derived depended on the amount of effort which students put into their reteach planning - efforts which, because of the variability in the characteristics of microteaching classes, were often not reinforced by perceptibly greater success.

Question 12:

The reteach lesson should

- (i) follow lines very similar to the teach lesson.
- (ii) provide further practice in an attempt to improve upon the "weaknesses" revealed in the teach lesson.
- (iii) deliberately follow a different approach.
- (iv) attempt to follow up the tutor's suggestions.
- (v) follow lines very similar to the teach lesson, different pupils providing a new experience.
- (vi) other (please specify).

Staff tutors and students were in agreement that the reteach should (and did) mainly concentrate on improvement of the weaknesses revealed in the teach lesson. A secondary aim was to attempt to follow up staff tutors' suggestions. Tutors did not feel that the reteach lesson should follow lines very similar to the teach lesson, although students responses indicated that, in practice, this happened quite frequently. Tutors commented that the nature of the reteach lesson depended upon the needs of the individual student and the adequacy of the teach lesson. Referring to the two teaching programmes, it was mentioned that the "improvement upon weaknesses" strategy was nearly always appropriate for the Stirling programme, but less often appropriate for the Alternative programme. It was felt that if the teach lesson of Alternative programme students had been adequate, the reteach lesson should be less of an exercise and more of a lesson, with the critique and replanning concentrating on using the kinds of questions already formulated in more strategic ways.

Question 13:

How necessary do you regard the provision of a tutor for the reteach lesson?

- (i) essential
- (ii) useful
- (iii) dependent upon performance in teach lesson
- (iv) unnecessary

The median point of student response to the question about the need of a tutor for the reteach lesson fell between the second and third categories, while the median point of tutor response was in the third category, "dependent upon performance in teach lesson". One tutor felt that the decision would be best based on students' expressed needs.

Question 14:

Two separate teaching programmes (Stirling/Alternative) have been offered in regard to the questioning behaviours. These programmes attempted to assist the students achieve similar objectives (see printed handouts).

It would be helpful if you would make specific comments regarding your appraisal of the two programmes, particularly emphasizing noted differences in students' behaviours which you believe might be attributed to one or other teaching programme.

There was general agreement among staff tutors that the Alternative programme students demonstrated a better mastery of the different questioning categories and the ability to formulate questions within the categories, seen in their lesson plans, their performance, and their capacity to evaluate their questioning behaviour after the lessons. It was felt that this may have been a function of the form of preparation, or the fact that the students had fewer objectives to focus on in the lessons.

Comments were made on the specific advantages of the Alternative programme. It was seen to be more structured, clearly defined, and programmed to concentrate on practice. The skill handouts were thought to be clearer. As a result, when used as a referral point for lesson evaluation, the major areas were easier to classify, but finer discrimination between marginal question categories became more difficult. The use of "criterion" and "probes" in the Alternative programme taught students to hold back on empty praise or rejection, allowing them to really listen to and ask for defence from the pupils.

Alternative programme students seemed to take the exercise more seriously, which may have been partly due to the course being special and new - but it was felt that the improvement in performance was mainly due to the clarity, repetition and structure of the course. However, these characteristics did mean that bounds were narrow in choice of topic and the lessons more traditional.

A few tutors commented on specific advantages in the Stirling programme. The students in this programme were freer in choice of topics, and the concept of "relevance" (i.e. establishing the interests and attitudes of children, and bringing questions down to the experiential level of pupils) was dealt with in "Questioning for Feedback" but was neglected in the Alternative programme. It was remarked that the Stirling programme was more ambitious, the teaching exercise less artificial, and the programme as a whole less thorough. However, the comment was made that in the post-treatment lesson, which was a much less structured task, the students in the Stirling programme seemed more able to integrate their acquired skills in different questioning behaviours into the task of teaching a lesson.

Question 15:

The total teaching programme was made up of lectures, curriculum and theory seminars as well as the provision of microteaching experiences.

Do you regard the provision of the microteaching component to be

- (a) not worthwhile.
- (b) worthwhile, and should continue much as at present.
- (c) worthwhile, to the extent that more time should be devoted to it.
- (d) worthwhile, to the extent that more time should be devoted to it at the expense of the lecture programme.
- (e) worthwhile, to the extent that more time should be devoted to it at the expense of the curriculum seminar programme.
- (f) worthwhile, to the extent that more time should be devoted to it at the expense of the theory seminar programme.
- (g) worthwhile, but less time should be devoted to it.
- (h) worthwhile, but less time should be devoted to it and more time given to (please specify).

Question 16:

List the criteria which contributed to your answer to question 15.

All students agreed that the microteaching component of the teaching programme was "worthwhile", and all staff tutors agreed that it was "worthwhile, and should continue much as at present". The principal justifications given by students for their judgment were that the microteaching lessons were a useful transition to the reality of the classroom situation, providing contact with pupils; and that the lessons provided an opportunity to put theory into practice, giving an insight into specific teaching behaviours.

Similar justifications were given by staff tutors, except that contact with pupils was not specifically mentioned. Several suggestions were made by tutors for ways in which the programme could be made even more worthwhile. More time could be spent on other aspects of the teaching programme (lectures and seminars) to provide a stronger back-up for the microteaching component, particularly in the Stirling programme. More could be done to cater for the individual, for instance in the provision of microteaching at a later stage as a remedial measure, or by allowing some students to have more sessions in which to perfect their practice of the behaviours (although this would mean reducing the total number of behaviours covered in each semester programme).

Question 17:

Do you have any comments to make regarding desirable modifications of the Stirling programme or the Alternative programme, or suggestions concerning a revised course structure which might include elements of both the Stirling and Alternative programmes?

Staff tutors made a number of suggestions for improvement of the programmes, mainly in terms of modifications to the Stirling programme by the introduction of certain aspects of the Alternative programme, such as the clearer assessment instrument, and a more structured introduction to the behaviours with the use of typescripts and written exercises. Some modifications to the Alternative programme were suggested, such as definition of the behaviour categories in a less restrictive way, and dropping unnecessary and arbitrary distinctions.

General restructuring suggestions included the postponement of the introduction of higher order or "synthesis" questioning behaviours until later in the course when students would have had more teaching experience, and the introduction of greater flexibility in programme

structure to cater for individual differences, by allowing students more or less practice time and a choice of feedback sources. It was suggested that this flexibility could be achieved through a branching loop programme, each section of which would depend upon the programmed materials, but with not all the materials necessarily being paralleled by microteaching exercises. This would allow the tutor and student a range of options for individual development.

Spring Semester 1973

QUESTIONNAIRE TO STUDENT TEACHERS - PRIMARY SCHOOL CLASSROOM
EXPERIENCE

At the conclusion of their Primary school practice teaching experience, student teachers were invited to respond to a single open-ended question (see Appendix H). The students were asked to write down the ways in which the classroom situation extended and/or limited their attempts to practise the questioning behaviours previously practised in the microteaching sessions.

The level of responses by students from the different semesters and treatment groups is set out in Table 96 .

Table 96

Primary School Experience Student Questionnaire

Response Level by Treatment Groups

Treatment group	Student teachers	
	Total number in group	Responses received
From Spring semester 1972		
Technical feedback:		
Audiotape	16	11
Videotape	17	11
Inter-personal feedback:		
Tutor present	13	12
Tutor absent	20	10
Control (no microteaching)	17	10

Table 96 (continued)

Treatment group	Student teachers	
	Total number in group	Responses received
From Autumn semester 1972		
Teaching programme:		
Stirling	15	9
Alternative	15	11
Technical feedback:		
Audiotape	16	12
Videotape	14	8
Inter-personal feedback		
Tutor present	17	12
Tutor absent	13	8

Students generally responded at some length (two completed questionnaires were included in Appendix P), and a classification of comments was made.

For the treatment groups which participated in microteaching experiences in their introductory education course, the clusters of comments formed an obvious dichotomy according to size. Six comment categories were referred to by 10-20 students; the remaining comments were made by only one or two students. It is the six categories that will be described in the following paragraphs.

Four ways were mentioned in which the classroom situation extended students' attempts to practise questioning behaviours:

- (a) the longer period of time available in the classroom lesson gave more scope for using the questioning behaviours;
- (b) the larger group of pupils ensured a wider range of feedback, with more ideas being brought forward and forming a basis for further questioning;
- (c) the classroom situation was less artificial than the microteaching situation; it allowed for a natural development of relationships with pupils and enabled the lesson to be fitted into the context of work in progress;
- (d) the microteaching experience gave students confidence in the classroom situation, and enabled them to focus more easily on the questioning behaviours - some students said that they were able to use the behaviours almost instinctively rather than in a premeditated fashion.

The consensus of opinion among students seemed to be that the classroom situation extended rather than limited their attempts to practise the questioning behaviours; that although there were some inhibiting factors, they were outweighed by the supportive factors. Twenty-two complete student responses identified both extending and limiting factors, sixteen identified extending factors only, and four identified limiting factors only.

There were two principal factors which limited students' attempts to practise the behaviours:

- (a) classroom discipline, management and control of the lesson often became a problem;
- (b) the larger number of pupils, while providing more ideas,

made it difficult to include all class members in the questioning, particularly the slower ones. As one student said.

Discipline, which had caused no real problem in microteaching, became rather more necessary, even if it was merely a question of controlling the answers to the questions and directing the discussion. In the classroom situation, the teacher (student) had to become a more mobile conductor as distinct from a static prober for various types of responses.

Although practice of the questioning behaviours in the microteaching context for the Spring semester 1972 control group was confined to the pre- and post-treatment lessons, yet responses from members of this group generally followed the pattern of the other groups. For this group a majority of responses suggested that the classroom provided a more realistic teaching situation, and a lesser number of responses acknowledged that the larger pupil group offered increased potential for the practice of questioning and associated behaviours. Consistent with their limited experience of microteaching sessions, the control group did not comment on the extension of time boundaries afforded by classroom practice or on the positive potential of microteaching as an introduction to classroom teaching.

As for other groups, the major limitation of the classroom was cited as pupil discipline and management.

In general, the nature of the responses in the various treatment groups was similar, but there were a few instances of divergence. In the teaching programme groups, nine of the eleven students from the Alternative programme referred to limiting factors, whereas only two of the nine students from the Stirling programme made such a reference. The fourth extending factor (that the microteaching

experience enabled students to use the questioning behaviours in the classroom situation with greater ease and confidence) was mentioned by eight students from the Alternative programme, but by none of the Stirling programme students.

Comparing the responses of the technical feedback groups (tutor present $n = 24$, tutor absent $n = 18$), the students with tutors recorded more instances of extending factors (39) than students without tutors (23), but the latter group recorded more limiting factors (19) than the former group (12).

Testing of Hypotheses

Hypotheses 8-10 and 12-15 to identify differences between variants of the three main treatment effects of teaching programme, technical feedback, and inter-personal feedback in attitudes towards, and reactions to, the teaching programmes and school classroom experience.

Hypothesis 11 related to interactions between these treatments and attitudes to the teaching programmes.

A detailed statement of these hypotheses has been given in Chapter I (p.43).

In the questionnaire to student teachers in the Autumn Semester 1972, measures of association between treatment groups were calculated for the responses to Section One of the questionnaire and for the multiple-choice questions in Section Two.

The analysis for Section One did not yield any result which was statistically significant ($P \leq .05$). In all, responses to seven items from Section Two of the questionnaire produced a significant

result. In five of these cases, however, the result was a reflection of the nature of the question itself rather than a real difference between treatment groups, e.g. Section Two, question 1(d). The significant difference in responses between the Stirling and Alternative programme students referred to the teaching programme activity "practice, based on stimulus material, in writing examples of the particular behaviour". This activity was a deliberate part of the Alternative but not the Stirling programme, and a significant difference in responses from the Stirling and Alternative programme students was to be expected.

Although different treatment groups were involved, a similar argument might also be applied to Section Two questions 8 (iii), (v), and 11 (i), (ii).

A significant difference in attitude between treatment groups was identified for only two question items: Section Two question 2(i) (Stirling/Alternative programme - association of Bloom's taxonomy with question categories) and question 9 (tutor present/absent - attention to subject content in replay sessions). Overall then, whilst in most respects attitudes expressed were very similar, there were also important differences especially in relation to the teaching programme variable, viz. that students and staff found the greater detail and structure of the Alternative programme materials and procedures an advantage, that the students who had taken the Alternative programme developed and maintained an even more positive attitude to microteaching, but that they were more conscious of limiting factors on the use of their skills in the classroom context.

The small number of persons involved in the staff tutors' questionnaire, and the open-ended structure of the single question asked of students after their primary school classroom experience, made a statistical analysis of the responses and a systematic testing of hypotheses inappropriate.

The qualitative evidence provided very little indication of important interactions. Where variations in attitude towards the teaching programmes and the school experience were expressed in the respondents' comments associated with the specific questions, the substance of these comments has been reported in the text.

CHAPTER VI

CONCLUSIONS OF THE STUDY IN RELATION TO RECENT RESEARCH

Microteaching currently has the same promise, and the same danger, that newly devised research and training techniques have always had: the promise of opening entirely new avenues, perspectives, and alternatives . . . the danger of locking in too early on a first alternative which arose purely out of chance and convenience (Allen and Ryan, 1969; preface/(iii)).

Although written 10 years ago, this summary statement by Allen and Ryan may well be applied to the present state of research into microteaching. The first decade of research was reviewed in Chapter I. Much of this work was descriptive; most of it related to microteaching and microteaching programmes as developed at Stanford University. Speaking of recent years, Perlberg (1976) suggested that a "review of the educational literature and agendas of research conferences . . . shows that there has been a sharp decline in the number of reported studies on microteaching and related areas" (p.13). Both antagonists and protagonists of microteaching would readily respond to Perlberg's statement. Opponents of microteaching would claim that the bubble had burst. Supporters would counter by referring to surveys of the use of microteaching in teacher education programmes conducted in Australia (Turney et al., 1973b), Germany (Brunner, 1973) and the United Kingdom (Maidment and Hargie, at press). Brunner reported that 33 percent of German institutions had integrated some form of microteaching into their programmes. Turney reported 40 percent in Australia, and the recent United Kingdom survey by Maidment and Hargie found that over 50 percent of British institutions were involved in microteaching. Although extreme caution is necessary in interpreting the meanings of both "microteaching" and "involved in" in such assertions, it could be inferred from such statistics that

microteaching has become an established part of teacher education programmes, so that it is no longer to be considered an innovation. The topic of microteaching is therefore less likely to dominate educational literature and conference platforms - which throws a different light on Perlberg's statement.

There is still considerable interest in the subject. New books have been published by Turney et al. (1973b) and Brown (1975a); an account of several facets of the research at the University of Stirling has been given by McIntyre et al. (eds.) (1977): analytical reviews of relevant research have been prepared by Griffiths, regarding the role of the tutor (1972a), the contribution of feedback (1974), the training of supervisors (1975), and the preparation of modelling materials (1976); an overview of research on microteaching and research on the effectiveness of microteaching has been published by Brown (1975b) and Hargie (1977a). Extensive development of training packages has been described by Perrott (1977) and Turney et al., (1973a; 1975; 1976; 1977), and comprehensive bibliographies of microteaching have been collated by Turney (1973b), McAleese and Unwin (1973), Parry and Gibbs (1974), Falus and McAleese (1975), Clift and Malley (1974), and Malley and Clift (at press).

Against the background of relevant current research, this final chapter will endeavour to place in perspective the findings and limitations of the present study. In conclusion, visible trends and likely lines of development will be outlined.

General Effectiveness of Microteaching and the Presentation Phase

In his review of research related to the general effectiveness of microteaching, Hargie (1977a) arrived at the conclusion that microteaching was an effective method of producing desirable changes in teaching behaviour. Further, the attitudes of trainees towards such a programme tended to be favourable. Such a conclusion was quite consistent with a number of recent studies concerned with on-going programmes of teacher education (Clift et al., 1974; Fairley, 1974; Levis, 1974; Butts, 1975; Brown and Armstrong, 1975).

The results of the experimental groups for the Spring semester 1972 in the present study would seem to support Hargie's statement relating to desirable changes in teaching behaviour. However, the presence and performance of the control group in this study adds a further dimension to the interpretation of the results. Experimental groups labelled "control groups" have been cited in several places. Unfortunately, it is difficult to generalize about the findings regarding control groups, as the latter have been defined quite differently from study to study. Kallenbach (1968), in field testing a minicourse on questioning behaviours, compared the performance of an experimental group given the full course, including written materials, demonstration films, model tapes, microteaching practice and feedback, with a control group which only read the materials. Results based on 11 measures indicated that the experimental group was significantly different from the control group on two measures only. Nuthall (1972) compared four experimental groups, three using minicourse materials, one of these not having microteaching practice, and a fourth control group taking

a conventional school experience programme. The three groups involved with minicourses used the skills to a greater degree than the control group. Peterson (1973) used the same minicourse materials when comparing an experimental group and a control group. In this case, the experimental group used the complete minicourse materials, and the control group viewed the instructional films and participated in a single microteaching session without feedback. Measures made in a subsequent school classroom lesson showed no significant differences between the groups. Stowitschek and Hofmeister (1974) used microteaching materials focussing on teacher tutoring techniques with an experimental group before class teaching whilst a control group conducted classes without this preliminary experience. The experimental group showed marked superiority in the relevant skills.

The control group of the present study took exactly the same programme as the experimental groups with the exception of the microteaching and feedback experiences. As already noted in Chapter IV (p.196), the control group's performance was not significantly different from the experimental groups on 15 of the 16 teacher and pupil behaviours adopted as criterion measures. This finding would appear to support the work of Kallenbach (1968) and Peterson (1973) indicating only slight differences where control groups had been at least partially exposed to preparatory materials, but had had little or no practice and no feedback. Therefore some doubts must gather regarding the importance, or indeed necessity, of the microteaching practice and feedback for the development of the desired behaviours. On the other hand, Nuthall (1972) and Stowitschek and Hofmeister (1974) obtained clearly significant

differences when control groups did not have experience of preparatory materials.

The most important outcome of the 1972 Autumn semester experiment in the present study related to the clearly superior and significantly different performance of the Alternative programme group on 14 of the 16 teacher and pupil behaviours when compared with the Stirling group. Both groups generally showed improvement, consistent with programme objectives, between pre-treatment and post-treatment lessons. This improvement was usually significant for the Alternative group, and often so for the Stirling group, but, overall the Alternative group performance far exceeded that of the Stirling group.

As outlined in Chapter III, the major difference in content between the two programmes occurred during the presentation phase; there having been comparable opportunities in both programmes for microteaching practice and feedback.

Evidence from the Spring semester experiment where the control group and the microteaching experience group did not differ significantly in their developed ability, suggests that microteaching practice adds little to the student teacher's ability to practise the criterion teacher behaviours. As the student teacher population for both teaching programmes in the Autumn semester experiment had comparable opportunities for microteaching practice - practice similar to that experienced by the Spring semester population - it was possible to conclude that the microteaching practice element had only a limited role in the achievement of the results reported for this semester.

Another issue relevant here is raised by a study reported by Katz (1976). She worked with pre-service student teachers using materials aimed to develop teaching skills associated with language-learning by kindergarten children having minimal language background. She found significant increases for the experimental group on only two of the 14 measures taken. By comparison Borg et al. (1970; p.124) working with teachers in an in-service context, reported significance on 10 of these 14 measures. Katz concluded that "further validation of the minicourse as a training mechanism for preservice teachers is required" (p.359), whereas Foster et al. (1973) are prepared to argue further. In noting the differences between two studies (Borg et al., 1969; Borg et al., 1970) using the same minicourse materials in preservice (1969) and in-service (1970) contexts, they conclude that "perhaps beginning teachers, inexperienced in classroom management, do not benefit as much as experienced teachers from an intensive and detailed component skills approach to teaching" (p.105). Brown (1975b) offers a similar interpretation of the lack of significant results in a study reported by Peterson (1973). However the results of the Autumn semester experiment in 1972 cast doubt on such interpretations.

That there might be critical elements in the microteaching format was referred to by Foster et al. (1973). He suggested that, "It may be possible . . . that the results now achieved with a full microteaching sequence can be obtained by using only portion of the process" (p.105). Wagner (1973) further developed this line of argument with an experiment which hypothesised "that, given the motivation to change, learning to discriminate between 'appropriate' and 'inappropriate' behaviour is sufficient for behavioural changes to occur" (p.299). Discrimination

training was described as learning to code teacher behaviour, and Wagner tested his hypothesis with three treatment groups. All groups were given written materials describing a desired behaviour - pupil-centred teaching behaviour. A control group received no further treatment. A second group prepared lesson materials and practised the desired behaviours in a microteaching situation. The third group, labelled the discrimination group, was presented with taped materials of teacher replies to pupil comments and invited to code the behaviours exemplified in the tapes. Feedback was provided. Criterion measures taken for all three groups in a post-treatment lesson indicated that the discrimination group's behaviour was significantly more pupil-centred than either of the other groups. The practices of the microteaching group were not found to be significantly more pupil-centred than the control group.

Wagner's hypothesis was therefore supported, and it was of particular relevance to the present study in that several elements of the presentation phase offered to the Alternative programme group fell within the definition of "discrimination training". Beyond the initial description and presentation of a rationale for the relevant behaviour, the Alternative programme offered the student transcripts of classroom interaction which exemplified the behaviour. As well, the programme incorporated test materials inviting the students to recognise the behaviour and to practise preparing lesson materials which included the behaviour. Finally, cued film sequences were presented to the students prior to the presentation of a microteaching lesson. To suggest that these elements of the Alternative programme were probably critical to the achievements of the Alternative

programme group would be consistent with the conclusions of Wagner.

MacLeod et al. (1977) also used three treatment groups in a study which generally supported the positive contribution of discrimination training to behavioural change. The subjects in this study were students studying education, with teaching subject specialties spread over five subject areas. Each student group was introduced to three Stanford-type skills, namely Variation, Questioning, and Clarity of Explanation, and at the conclusion of the treatment programme criterion measures of students' ability to practise all three of the skills were taken in a microteaching situation. All three treatment groups were offered an explicit theoretical and practical rationale for each skill. This represented the total treatment for one group. In addition, the second group was offered modelling materials in the form of cued video tapes, microteaching practice, videotape, and supervision feedback. The third group also had discrimination training - practice in identifying skill use - added to its treatment prior to the microteaching practice. Of 14 criterion measures, the third group achieved higher mean scores than the first group on 12 occasions, but only twice were these differences significant.

Two of the conclusions derived from this study are worthy of note at this point. First, MacLeod stated that "although there is a clear trend for microteaching with discrimination training to lead to superior performance of the skills, this trend is in general overwhelmed by the extent of the individual differences among students" (p.258). The programme format of the Alternative group in this study was very similar to that of the microteaching with discrimination training group in the MacLeod study. Both groups achieved positive results. To this extent then, the results of the two studies

supported one another. On the other hand, individual differences did not appear to submerge the differential in the results of the present study as they appeared to have done in the MacLeod work. Commenting on this situation McIntyre (University of Stirling; personal communication) observed that the Alternative programme of the present study gathered "a commitment from the students to a highly analytical and structured approach which is not common among undergraduates." This commitment may have boosted the performance of the Alternative students to the point that individual differences no longer dominated the results. The second conclusion to be noted is that MacLeod reported that "the effect of discrimination training is very much greater for one of the skills (Questioning) than for the other two" (p.258). This is probably not surprising as different skills almost certainly vary in their potential for presentation in a systematic and analytical manner akin to minicourse materials or methods incorporating discrimination training. The present study was of course based around questioning behaviours and provided support for this aspect of the MacLeod finding. However, other studies which included discrimination training (Goldthwaite, 1968; Wagner, 1973) have focussed upon quite different behaviours and achieved positive results. Only further research will clarify this situation. Hargie and Maidment (1978) have reviewed several well-known studies and suggested that discrimination training might be a common and critical element in the interpretation of the results. They quoted Waimon and Ramseyer (1970), Peterson (1973), Kallenbach and Gall (1969), Kissock (1971) and Yorke (1977) as conducting studies which failed to establish differences between the various treatment groups involved.

Hargie and Maidment considered that the discrimination training offered to the various treatment groups in each study was more influential than any other treatment factors, such as feedback differences or the comparison of microteaching experience with classroom teaching or no practice teaching at all, in bringing about changes on criterion measures.

Consideration of the evidence across all of these studies, including the present study, revealed that there was quite promising evidence for the inclusion of discrimination training in the format of a microteaching programme. Given that there would appear to be some doubts about the effectiveness of the microteaching practice component of such a programme (and, no doubt, by inference, the effectiveness of the classroom teaching practice component of a traditional teacher education programme) then, before final conclusions are drawn, it must be recognised that there are gaps in the evidence presented in these studies. Evidence derived from the present study and the MacLeod et al. (1977) study would have been enhanced by the addition of a treatment group which included discrimination training but excluded microteaching practice. Wagner (1973) included such a group, but lacked a group which offered both discrimination training and microteaching practice.

Finally, it is well to note a summary comment by Wagner (1973). Speaking of the results of his study Wagner (1973) says, "The results . . . do not exclude the possibility that practice in addition to discrimination training may prove to be effective by serving other functions in the process of behaviour change" (p.305). A similar reminder was also offered by MacLeod et al. (1977) and Hargie and Maidment (1978). Discrimination training, therefore, as

part of the format of a microteaching programme, can be seen as a potentially valuable aspect of the "promise" referred to by Allen and Ryan (1969) in the quotation which heads this chapter; the "danger" might be to eliminate simultaneous microteaching practice before assessing the potential role of the two practices in tandem.

The Feedback Phase

INTER-PERSONAL FEEDBACK

Despite the recommendation of Parry and Gibbs (1974) that the growth of microteaching has rendered more urgent the study of methods of supervision, recent studies which have manipulated this variable have only reaffirmed the conclusion reached by Griffiths (1975) that "Clearly no firm conclusions about supervisor effectiveness can be drawn without ignoring some of the available evidence" (p.193). The present study confirmed previous evidence and some recent data (Edwards, 1975; Levis, 1974; Griffiths et al., 1977) that variations in supervisory strategies, whether centred about a staff tutor or some form of student self-analysis, produced no significant differences in the degree of development of specified teaching behaviours.

Much earlier, Borg et al., (1970) had argued that supervisors were unnecessary and that their functions could be served equally effectively by other means. Brusling (1972) declared supervisors to be expensive and administratively awkward. Recently Perrott (1976b) described supervisory conferences as "the least effective aspect of the microteaching model" (p.16). However, gentle encouragement for the presence of a supervisor has come from Fuller and Manning (1973) who suggested that the presence of "focusers" (supervisors) would

encourage change if they adopted a non-evaluative role and acted as goal negotiators. Peck and Tucker (1973) concluded that "teachers use . . . feedback to make instructive changes in their teaching style only if another person participates in the feedback session" (p.947).

Students reacted positively to the presence of supervisors in a study reported by McIntyre (1977). McIntyre sustained the general conclusion that there was little general relationship between the presence or absence of a supervisor and a student's performance of skills, yet believed that "the presence of a supervisor may be necessary, at least in the Scottish context, for student morale" (p.119). This summary statement has been supported outside Scotland. Hargie (1977b) mirrored McIntyre's comment about student morale. Edwards (1975) found that students were distressed with a self-instructional microteaching format and stated a need for expert advisory feedback. Levis (1974) found that students associated with supervisors held more favourable attitudes towards the training programme and teaching in general. In the present study, students reacted positively to staff tutors' comments. They indicated a lack of satisfaction with replay sessions which were not attended by supervisors. Students offered the firm recommendation to tutors that, during supervision, the student should be encouraged to state his objectives and to justify his behaviour (see Chapter V; p.361).

In conclusion, there might be some disappointment that research evidence on "the role of the supervisor is, at best, equivocal" (Brown, 1976). However, in the present study, students indicated a strong preference for working with a supervisor. In any assessment of microteaching programmes, this preference should be considered in

parallel with the research evidence on the benefits of supervisory feedback.

TECHNICAL FEEDBACK

The present study found no evidence of differential competence in teaching behaviours that could be attributed to one or other form of technical feedback. Such a result was consistent with recent research. Hiscox and Van Mondfrans (1972) conducted two experiments, one for a verbal skill (questioning techniques), the other for a psychomotor skill (silence and non-verbal cues, and variation of the stimulus situation). The results revealed no differences in the effectiveness of audiotape and videotape as forms of feedback for both the verbal and psychomotor skills. Levis (1974) found "no marked or consistent advantages in favour of either videotape or audiotape feedback in terms of skill performance" (p.302). Two further studies have concluded that the addition of videotape replay to the feedback session had not produced significant changes in the role or quality of the skill learnt (Clift et al., 1976; Gormally et al., 1975). Jesson (1974), later supported by Ely (1976), pressed for a selective use of video feedback, and as well raised another familiar topic in regard to videotape feedback, namely the cost of video equipment. In a full analysis of the costs associated with the microteaching component of a teacher education programme, Clift et al. (1974) found that, in terms of its effectiveness to produce change, the costs of providing video-recording and video-feedback systems could not be justified. In a preliminary report of a cost effectiveness study, Kennedy (1975) gave notice of further evidence in this area. Certainly it would appear an unwarranted cost to use videotape

feedback indiscriminately in preference to audiotape feedback or any other form of feedback. As Griffiths (1974) concluded, "Currently we can only guess the conditions under which each source of feedback may or may not be valuable" (p.10).

Student reaction to videotaped microteaching has generally been positive (Olmo, 1973; Brown and Armstrong, 1975; Klingstedt, 1976). In the present study the need for a videotape replay was cited as a principal reason for a lack of satisfaction with the replay session. Stirling programme students given videotape believed it offered them a window into the total classroom. On the other hand, some Alternative programme students preferred audiotape feedback as it enabled them to concentrate on skills behaviour.

Fuller and Manning (1973), and later Bierschenk (1975), pursued a different line of research related to the provision of videotape feedback in microteaching situations. They evaluated a person's ability to make use of the information provided via the feedback in order to encourage behaviour modification. Fuller and Manning produced a complex set of conclusions. They found self-confrontation to be stressful and arousing, often resulting in intense focussing on self, but as well increased realism about self. In terms of performance, they suggested that sometimes it was improved, at other times disrupted; whilst behavioural changes varied from temporary acquisition to permanent acquisition.

Some reaction to this work came from Griffiths (1974) and MacLeod (1975). Griffiths, in reviewing the contribution of feedback to microteaching, indicated that a research priority should be an "examination of the factors which influence information-

selection during self confrontation on audio or video-tape" (p.10). MacLeod (1975) challenged the applicability of Fuller and Manning's conclusions to the self-confrontation situation in microteaching because Fuller and Manning had based much of their argument on literature outside teacher education (i.e. psychotherapy). MacLeod followed his criticism of Fuller and Manning with some innovative and significant research which seemed likely to provide a foundation for considerable further contemplation about how students learn from microteaching. Within the broad framework of gathering students' written reactions to their own microteaching, he explored the effects of videotape - and skill related-feedback on students' perceptions of their microteaching lessons. Among his findings was that there were no discernible differences between the perceptions of students who had received videotape feedback and of those who had received no technical feedback (MacLeod, 1977). If it were similarly true of the samples in the present study that the nature of the technical feedback they received did not affect the perceptions of their lessons, it is not surprising that there were no significant differences in their acquisition of skills (see Chapter VI, p.413).

Transfer

Griffiths reported in 1973 that "we still know very little indeed about the transferability of microteaching skills" (p.7). Since the inception of microteaching, a relationship has been assumed between it and classroom teaching. In making an assessment of teacher and pupil behaviour - and occasionally pupil achievement - in the classroom following microteaching experiences, it was anticipated that the evidence gathered would validate the

microteaching procedure.

The doubts expressed by Berliner (1969) (see Chapter I, p.17) regarding the transfer effect from microteaching lessons to classroom lessons have been echoed by others. Griffiths (1972b) in a paper "Some Troublesome Aspects of Microteaching" suggested that "any microteaching programme is unlikely to be able to sample representatively all . . . teacher behaviours relevant to successful execution of the teacher role" (p.14). Copeland (1975) felt that the "exhibition of skills" was only a part of the total teaching role:

(the) main assumption underlying the inclusion of microteaching in teacher education programmes, i.e. that microteaching is significantly related to student teacher classroom performance, is a simplistic assumption which does not take into account the existence of other factors which might interfere with classroom performance (p.292).

As examples of these "other factors", Copeland cited pupils, the teacher's perception of the role of teaching, teacher self-confidence and the supervising teacher. Morrison and McIntyre (1973) believed student teachers might well be confident that a specified skill was of value in teaching, yet they might face a dilemma in deciding whether or not it was appropriate to use that skill in the context of any particular lesson.

Stones and Morris (1972) reported a conception of teaching "as an orchestration of skills . . . training may start with isolated elemental skills, but it must also put the teacher back together again" (p.101). Griffiths (1972b) saw real teaching as involving the blending of several behaviours. Perlberg (1975) believed, "There is growing interest in the development of 'high order' skills which require proficiency and mastery in the

basic skills, but are, in themselves more complicated and often described as 'strategies' or 'styles of teaching'" (p.2). Other researchers stressed the inter-personal nature of teaching (Sadker and Sadker, 1975; Copeland, 1975; Lindop, 1978) and suggested that microteaching programmes should be modified to allow student teachers to develop their own particular competencies.

Student teachers participating initially in microteaching programmes and subsequently in classroom practice situations offered some evidence relevant to this issue. Student teachers in Hargie's study (1977b) indicated that,

teaching in the classroom situation was not at all similar to teaching in the microteaching situation . . . (yet) . . . they did in fact use the skills learned in microteaching when confronted with "real" teaching (p.26).

The reactions of students involved in the present study were generally in support of this view. They appreciated the extension of time and the increased variations in pupil involvement and relationships which a classroom lesson provided. At the same time they noted an instinctive application of some of their microteaching behaviours. However, in support of the doubts expressed earlier, they did admit that issues of management and discipline became a more central concern in the classroom lesson.

Some attempts have been made to accommodate this complexity and, as a result, modifications have been made to the practice phase of microteaching programmes. Brown and Armstrong (1975) reported a pattern of skills in three clusters - exposition, questioning and (teacher and pupil) answering, and discussion. Each skill cluster included several specific skills, and students practised both individual skills and combinations of skills. In the final section

of the programme the students planned and taught a series of lessons using any combination of teaching methods they chose. This approach promoted the gradual integration of individual skills and their use in the complete act of teaching. Similar objectives have been cited by Hargie et al. (1978) in their report titled "Mini-teaching: an extension of the micro-teaching format". The introductory sections of the programme resembled other microteaching programmes, with theory lectures describing teaching as being within a framework derived from the social psychology of inter-personal behaviour. Mini-teaching, then, differed from microteaching in the practice sessions. The traditional reteach lesson was abandoned and instead, at various stages throughout the programme, the student taught a lesson which integrated several skills - "the student teacher is encouraged to regard these skills as interactive variables rather than completely discrete units" (p.115). As well, the length of lessons and numbers of pupils in the microteaching classes was gradually increased to achieve a closer approximation to the real classroom situation. In two other studies, Borg (1977) and Borg and Stone (1974) grouped several teacher and pupil behaviours into units called "modules". They then developed training materials called "protocols". The term "protocol" was introduced by Smith (1969) and represented "recordings of behaviour in educationally relevant situations that could be used to help teachers (or teacher trainees) relate basic theoretical knowledge of pedagogy to the teaching process" (Borg and Stone, 1974; p.34). Research, planned to determine whether these protocol modules brought about changes in teacher and pupil behaviours, modified the microteaching practice

experiences by including several weeks of training to offer the teachers additional experience in using the recently learned behaviours. Borg (1977) believed such extra practice was necessary "to give teachers an opportunity to try out the behaviours they had learned in different combinations and to try to fit these combinations of behaviours into their own style of teaching" (p.13).

The empirical evidence gathered in the present study revealed that student teacher performance in the classrooms was comparable to that on the post-treatment microteaching lesson. The major variation in performance was that, whilst still superior on the nominated behaviours, the Alternative programme group was no longer significantly superior in the classroom situation. A "fall-off" in performance between the microteaching lesson and the classroom lesson has been reported in other studies. Peterson (1973), seven weeks after the completion of a minicourse programme, compared the performance of his experimental group (microteaching) and a control group (described as "no microteaching"). On the measures taken in the school classroom, Peterson found no significant difference between the groups. In discussing this result, Peterson commented that, immediately after the minicourse, the staff felt that the experimental group were "more aware of exactly how to use the 12 behaviours . . . (and) better able to implement them in small group settings" (p.36). Peterson suggested that his experimental group might have needed a "refresher" experience. Copeland and Doyle (1973) and Copeland (1975) reported no significant difference in the classroom situation between groups which had had microteaching experiences and those which had not. It was suggested that the microteaching groups possibly "forgot" the skills as time passed, and that certainly the complexity of a

classroom lesson created a very different teaching environment to that previously encountered in microteaching.

It is likely that many student teachers experience some conflict in the classroom between the need to develop a whole lesson and the practice of a particular behaviour previously introduced in the microteaching situation. As yet, it appears difficult to determine what might be an appropriate or reasonable form of evidence of the positive transfer of behaviours introduced in microteaching and subsequently practised in the school classroom. Applebee (1976) suggested the problem was partly methodological. He noted that post-treatment lessons or follow-up lessons in school classrooms often seemed to

reflect the conscious use of component skills, rather than their assimilation into . . . normal teaching . . . the lessons are full of . . . 'skills' introduced simply because 'we need some more', not because a given technique will contribute to the progress of the lesson at that particular point (p.41).

In a recent series of developments, a quite different interpretation of the term "transfer" has been reported which included the refinement and development of materials originally produced in one country, and subsequently used in another country (Perrott, 1974). A project was mounted in 1972 involving five universities in four European countries, namely, Germany, the Netherlands, Sweden, and the United Kingdom (Perrott, 1976a). A major objective of the project was the "transfer, redevelopment, and evaluation of self-instructional microteaching materials originally developed in the United States" (Applebee, 1976, p.36). As a consequence the minicourse titled Effective Questioning - Elementary Level (Borg et al., 1970) was adapted, tested and redeveloped for use in Britain. (Perrott et al., 1975). The redevelopment was described by

Perrott (1977; p.32) as having been concerned with matters such as:

- (a) problems of translation between American and British educational idiom;
- (b) alteration of the presentation of materials in order that they take on a more formal and impersonal tone;
- (c) alteration of film sequences to present examples familiar to British teachers;
- (d) alteration of the organisational pattern of the programme for use as a centre-based, rather than a school-based, programme;
- (e) as a result of field testing, the re-ordering of instructional sequences, and other changes in emphasis.

It was disappointing to find little evidence offered of the need for such modifications and the lack of detailed guidelines regarding the nature and extent of the modifications. Applebee, formerly a member of the Perrott research team, seemed less than convinced about the process. He believed the revised British materials to be an improvement on the original American programme but stated "whether the adaptation is enough better to have been worthwhile is at least questionable" (Applebee, 1976, p.39). He went on, "There are many other uses for scarce resources if the original products would work sufficiently well in the British context" (p.42). Leaving aside questions of content and teacher education strategy, the consistent and impressive results of the Alternative programme group in this study - based upon American minicourse materials - must provide some hard evidence for Applebee's concerns.

Students' Reactions to Microteaching

Student reactions and attitudes continue to be positive concerning microteaching programmes. Words and phrases found in the literature include "valuable" (Olmo, 1973; Brown and Armstrong, 1975), "worthwhile, beneficial" (Hargie, 1977a), "positive attitude" (Klingstedt, 1976), "enthusiastic" (Applebee, 1976; Butts, 1975; Perrott et al., 1976), "valuable preliminary to classroom teaching" (Brown and Gibbs, 1973; Wright, 1973). The present study is one of a small number of studies which have attempted to gather in-depth evidence of student reactions to the microteaching programme in general and to various elements of the microteaching programme (Brown and Gibbs, 1973; Perrott et al., 1976; MacLeod, 1977; Hargie, 1977b). The reactions to the overall programme have been unanimously positive, and the criteria offered for this view are consistent with previous studies - namely, a suitable introduction or transition to the reality of the classroom; contact with children; the opportunity to put theory into practice; a general insight into teaching; opportunity for self-evaluation; an enjoyable, stimulating experience.

MacLeod (1977), however, has suggested that it is not only students' attitudes to microteaching which require consideration but also the cognitive schemata with which they approach their microteaching lessons and which may change as a result of these experiences. Thus in his own empirical research he identified certain trends. Firstly, as their experience of microteaching increased, students demonstrated an increased attention to the pupils they were teaching: they evaluated the lessons, and their own behaviour, in terms of desired pupil behaviours. Attraction to their own personal characteristics was initially small, and it decreased

rapidly with microteaching experience. This result contradicted the belief that the provision of videotape feedback in microteaching encouraged an emphasis on personal characteristics. MacLeod concluded: "Typically they (the students) become preoccupied with the behaviour they see and the consequences of that behaviour and fail to take note of the appearance of their body" (p.203). Secondly, students revealed a high degree of task orientation and demonstrated an ability to assess their own behaviour accurately in regard to the relevant tasks. Thirdly, students tended to evaluate their lessons negatively, a factor which decreased with increasing experience of microteaching.

It is useful to examine students' comments on the various components of microteaching from this cognitive perspective. MacLeod (1977) found that a substantial proportion of the variations among reteach sessions could be accounted for by the variations in the comments made by the students after their teach lesson. The existence of a cognitive framework prior to microteaching probably explained the apparent lack of impact of either form of technical feedback used in this current study or in numerous other studies. The relationship between data offered on audiotape or videotape and the student pre-planned cognitive framework would generally be slight. In the case of inter-personal feedback, i.e. the presence of a staff tutor, the opportunity existed for an expression of the student's pre-lesson cognitive framework and planning for the lesson. The supervisor probably interacted with the student regarding variations for a future teaching session. This view was consistent with the expressed attitude of students that supervisors should encourage the student to take the initiative in interpreting

behaviour during replay sessions. A tentative interpretation of the students' views on these matters might be that the comments offer some indication of what helps them to make sense of their experience and allow them to develop generalized images and plans for teaching.

A possible common element to the range of schemata held by groups of students might be specialist teaching subject content. MacLeod et al. (1977) experimented with a student population grouped into three categories of specialist teaching subjects. Each student group practised three skills in the microteaching situation. The results indicated that the three teaching subject groups varied in respect to each other and in respect to the particular skill being practised. In the light of this evidence, it was disappointing that the reports on microteaching by subject-specialist tutors (McIntyre et al., 1977; pp.225-251) did not appear to have attempted the development of skills or strategies particularly relevant to their individual subject-specialist areas. The present study did not differentiate students by teaching-subject groupings nor did it attempt to gather data across a range of skill areas. However, the findings of this study in regard to discrimination training and the work of MacLeod seemed to indicate that further research in these aspects would be worthwhile.

In a critique of microteaching methods, Andrews (1971) remarked "There may be a case for arriving at the analysis (of the classroom) with the students rather than presenting the components ready made" (p.30). MacLeod's work would suggest some support for this point of view; however in an interpretation of this work MacLeod and McIntyre (1977) argue for a negotiation position between

student teacher and experienced tutor. They suggest that students need both concepts and procedures to be fed to them in order to maximize the use of the practice experience. Generally, students seem to prefer an experienced person providing them with hypotheses to test. It would seem that unless students' thinking is guided by evidence and reflection other than their own, they appear to be in danger of developing conceptual schemata relevant only to the microteaching context. To teacher educators the situation in microteaching research is undoubtedly one of considerable challenge and complexity. The evidence suggests the need for a review of the events and strategies which make up classroom interaction in terms of the student teacher's own cognitive framework and perceived priorities. The promise held for such an analysis must be that, when translated into a form suited to development and practice in a microteaching situation, the strategies seem likely to be successfully incorporated into more permanent teaching behaviour.

Concluding Summary

This study set out to investigate factors influencing the effectiveness of the microteaching component in an on-going programme of teacher education.

Empirical research was conducted over three stages. Based upon a common teaching programme, in the first stage variations in technical and inter-personal feedback to microteaching experiences were explored. As well, one group of the experimental population completed the programme without microteaching practice. Significant improvements were recorded in post-treatment measures across all experimental groups for designated teacher questioning and pupil

response behaviours. However, no significant differential in performance occurred between any of the experimental groups. In the second stage, the total experimental population was split, and two separate microteaching programmes were offered. The same variations in technical and inter-personal feedback were included within each teaching programme. The major difference in approach between the teaching programmes was an emphasis in one programme on discrimination training activities. The performance in a post-treatment measure of the experimental groups from both programmes was generally significant and consistent with programme objectives. In addition the performance of the experimental group which had discrimination training activities included in its programme was significantly superior on almost all designated behaviours. No difference in performance was evident between the various feedback experimental groups. Members from all the experimental groups of the first two stages participated in a third stage teaching experience in a primary school classroom. In general, the same profile of results was obtained from a criterion teaching lesson in this context. A notable feature of the results was that the experimental group which had included discrimination training in its programme no longer excelled to quite the same degree as it had done in the microteaching situation. Attitudes and reactions to the programmes and the various elements of the programmes were sought through questionnaires administered to student and staff participants in the second and third stages of the research.

The performance of a control group which had not participated in microteaching experiences must cause concern to the organizers of microteaching programmes, and requires careful consideration of the

role of the teaching practice sessions. Questionnaire data obtained later from students, and statements of total course objectives, indicated that objectives other than those concerned with the specific behaviours under scrutiny in this study underlie the microteaching sessions. The identification and elaboration of these additional objectives is necessary to clarify the potential of microteaching experience.

Research has supported the use of discrimination training activities in the process of acquisition of appropriate classroom behaviours. This study confirms these conclusions in general, but does not provide enough evidence to comment separately on the contribution of discrimination training in association with, or apart from, microteaching practice.

The issue of the transfer of behaviour from the initial learning context, microteaching, to a subsequent context, the school classroom, is probably confusing for student teachers in that they are expected to demonstrate their ability with specified behaviours whilst at the same time coping with the much broader range of behaviours which occur in a school classroom. This study found that the students' performance in the classroom maintained the performance previously recorded in the microteaching context. Perhaps such a situation is evidence of the retention of an ability to perform specified behaviours rather more than the demonstration of competence as a classroom teacher.

Recent research encourages a new appreciation of the contribution of microteaching to teacher education. Realization of the potential of microteaching appears to depend upon an appropriate presentation of behaviours which takes into account students' cognitions and

expectations concerning their teaching experience. Such a situation must lead to a loosening of the structures and organization of a traditional microteaching programme and towards a fresh analysis of classroom behaviours, of the key elements of the microteaching process, and of students' understanding of classroom interaction.

REFERENCES

- Acheson, K. 1964. Effects of feedback from television recordings and three types of supervisory treatment on selected teacher behaviour. Ph.D. Thesis. Stanford University. University Microfilms 64-1352.
- Acheson, K.A. and Tucker, P.E. 1971. Videotape versus written transcripts and videotape versus audiotape feedback in a Minicourse on Higher Cognitive Questions. Report A71-18. Far West Laboratory of Educational Research and Development. Berkeley, California.
- Acheson, K.A. and Zigler, C.J. 1971. A comparison of two teacher training programs in Higher Cognitive Questioning. Report A71-19 Teacher Education Division Publication Series. Far West Laboratory of Educational Research and Development. Berkeley, California.
- Adams, T.H. 1964. The development of a method for analysis of questions asked by teachers in classroom discourse. Ph.D. Thesis. Rutgers State University, New Brunswick, New Jersey.
- Allen, D.W. 1966. Microteaching . . . A new framework for inservice education. High School Journal. 49, 355-362. Also available from ERIC ED 013 240.
- Allen, D.W. 1967. Microteaching, a description. California: Stanford University, ERIC ED 019 224.
- Allen, D.W. and Clark, R.J. 1967. Microteaching: Its rationale. High School Journal. 51, 75-79.
- Allen, D.W. and Fortune, J.C. 1966. An analysis in microteaching: A new procedure in teacher education. In Microteaching: A description. School of Education, Stanford University, California. Mimeograph.
- Allen, D.W. and Ryan, K. 1969. Microteaching. Massachusetts: Addison-Wesley.
- Allen, D.W. et al. 1967. A comparison of different modeling procedures in the acquisition of a teaching skill. American Educational Research Association, Conference Report. ERIC ED 011 261.
- Allen, D.W. et al. 1969. Teaching skills for elementary and secondary school teachers. General Learning Corporation, New York.

- Alper, T., Thoreson, C. and Wright, J. 1972. The use of film-mediated modeling and feedback to change a teacher's classroom responses. Stanford Centre for Research and Development in Teaching. Memorandum No.91. Stanford University, California.
- Andrews, R. 1971. Microteaching methods: A critique. University of London Institute of Education Bulletin. 23, 25-31.
- Applebee, A.N. 1976. Microteaching, component skills and the training of teachers: An evaluation of a research and development project. British Journal of Educational Technology. 7, 35-44.
- Aubertine, H.E. 1964. An experiment in the set induction process and its application in teaching. Unpublished doctoral dissertation. Stanford University, California.
- Ausubel, DP. 1968. Educational Psychology, a Cognitive View. New York: Holt, Rinehart and Winston.
- Ausubel, D.P. and Robinson, F.G. 1969. School Learning: an Introduction to Educational Psychology. New York: Holt, Rinehart and Winston.
- Bandura, A. and Ross, Dorothea and Ross, Sheila. 1963. Imitation of film-mediated aggressive models. Journal of Abnormal and Social Psychology. 66, 3-11.
- Bandura, A. and Walters, R. 1963. Social Learning and Personality Development. New York: Holt, Rinehart and Winston.
- Barr, A.S. et al. 1961. Wisconsin studies of the measurement and prediction of teacher effectiveness: A summary of investigations. Journal of Experimental Education. 30, 5-156.
- Bartley, Diana, E. 1969. Microteaching: Rationale, procedures and application to foreign language. Audiovisual Language Journal. 7, 139-144.
- Bellack, A.A. et al. 1966. The Language of the Classroom. New York: Teachers College Press, Columbia University.
- Berliner, D.C. 1969. Microteaching and the technical skills approach to teacher training. Technical Report No. 8. Stanford University, California ERIC ED 034 707.
- Bickel, F.C. 1970. The effects of sex and age as variables in a microteaching modeling procedure. Doctoral dissertation, University of Kentucky.
- Bierschenk, B. 1975. Perceptual, evaluative and behavioral changes through externally mediated self-confrontation. UNESCO, Paris.

- Birch, D.R. 1969. Guided self analysis and teacher education. Berkeley, California. ERIC ED 040 118.
- Bjerstedt, A. 1967. Interaction - oriented approaches to the assessment of student teachers. Journal of Teacher Education. 18, 339-357.
- Bjerstedt, A. 1968. CCTV and Video-Recordings as 'Observation Amplifiers' in Teacher Training. Malmo: Department of Educational and Psychological Research, School of Education.
- Bloom, B.S. et al. 1956. Taxonomy of Educational Objectives: The Classification of Education Goals, Handbook 1: Cognitive Domain. New York: David McKay.
- Borg, W.R. 1968. The minicourse: rationale and uses in inservice education of teachers. ERIC ED 024 627.
- Borg, W.R. 1970. Minicourse instructional model. Paper presented at the annual meeting of the American Educational Research Association.
- Borg, W.R. 1977. Changing teacher and pupil performance with protocols. Journal of Experimental Education. 45, 9-18.
- Borg, W.R., Kallenbach, W. Morris, M. and Friebel, A. 1969. Videotape feedback and microteaching in a teacher training model. Journal of Experimental Education. 37, 9-16. Also, ERIC ED 024 650.
- Borg, W., Kelley, M.L., Langer, P., and Gall, M. 1970. The Minicourse: A Microteaching Approach to Teacher Education. London: Collier-Macmillan.
- Borg, W.R., and Stone, D.R. 1974. Protocol materials as a tool for changing teacher behaviour. Journal of Experimental Education. 43, 34-39.
- Brashear, R.M., and Davis, O.L. 1970. Persistence of teaching laboratory effects into student teaching: a comparative study of verbal teaching behaviours and attitudes. ERIC ED 039 176.
- Britton, R.J., and Leith, G.O.M. 1971. Systems development in teacher training evaluation studies. An experimental evaluation of the effects of microteaching on teaching performance. Sussex University, U.K. Mimeograph.
- Brown, G.A. 1971. Microteaching: Innovation in teacher education. Education for Teaching. 86, 11-15.
- Brown, G.A. 1975a. Micro-teaching: A Programme of Teaching Skills. London: Methuen.

- Brown, G.A. 1975b. Microteaching: research and developments. In Chanan, G. and Delamont, Sara (eds) 1975. Frontiers of Classroom Research, Windsor: NFER.
- Brown, G.A. 1975c, Microteaching: Some recent developments in Ulster. The Forum of Education. 34, 89-96.
- Brown, G.A. 1976. Introducing and organising microteaching. Educational Media International. 2, 21-29.
- Brown, G.A. and Armstrong, Sheila. 1975. More about microteaching. Trends in Education. 1, 49-56.
- Brown, G.A. and Gibbs, I. 1973. Some students' reactions to microteaching. New University of Ulster, Northern Ireland. Mimeograph.
- Brunner, R. 1973. Microteaching an den Hochschulen der Bundesrepublik Deutschland. Psychology in Erzieh U Unterr. 20 Jg. 269-298.
- Brusling, C. 1972. An Experiment on microteaching at the Gothenburg School of Education, Gothenburg, Sweden. Paper presented to International Micro Teaching Symposium, Universitat Tubingen, West Germany.
- Brusling, C. 1974. Microteaching: A Concept in Development. Goteborg: Pedagogiska Institutionen.
- Bush, R.N. (ed). 1968. Microteaching: a description. Mimeograph.
- Butts, D.C. 1975. An assessment of Microteaching in the context of the graduate training year. Unpublished master's thesis, University of Stirling.
- Campbell, D.T. and Stanley, J.C. 1963. Experimental and quasi-experimental designs for research on teaching. In Gage N.L. (ed) 1963. Handbook of Research on Teaching. Chicago: Rand McNally.
- Claus, Karen E. 1969. Effects of modeling and feedback treatments on the development of teachers' questioning skills. Technical Report No. 6. California: Stanford Centre for Research and Development in Teaching, Stanford University, ERIC ED 033 081.
- Clements, R.D. 1964. Art student-teacher questioning. Studies in Art Education. 6, 14-19.
- Clift, J.C., Batten, H.D., Burke, G. and Malley, J.I. 1974. A cost effectiveness study of the use of microteaching in the education of teachers. A report submitted to Educational Research and Development Committee, Canberra, Australia. ERIC ED 151 317.

- Clift, J.C., Batten, H.D., Burke, G. and Malley, J.I. 1976. Structure of the skill acquisition phase of a microteaching programme. British Journal of Educational Psychology. 46, 190-197.
- Clift, J.C. and Malley, J.I. 1974. Bibliography of microteaching with selected annotations. In Clift, J.C. et al. 1974. A cost effectiveness study of the use of microteaching in the education of teachers. ERIC ED 151 317.
- Cohen, J. 1960. A coefficient of agreement for nominal scales. Educational and Psychological Measurement. 20, 37-46.
- Collofello, Patricia, et al. 1969. The relative effectiveness of two sources of feedback on teachers in the microteaching situation. Minnesota Research Co-ordinating Unit for Vocational Education, Minneapolis. ERIC ED 044 490.
- Conners, C.K. and Eisenberg, L. 1966. The effect of teacher behavior on verbal intelligence in Operation Headstart children. Baltimore: John Hopkins University School of Medicine. ERIC ED 010 782.
- Cooper, J.M. 1967. Developing specific teaching skills through microteaching. High School Journal. 51, 80-85.
- Cooper, J.M. and Allen, D.W. 1970. Microteaching: History and present status. Association of Teacher Educators' Research Bulletin. No.9, 8-39.
- Cooper, J.M. and Stroud, T. 1966. The Stanford summer microteaching clinic in microteaching. A description. School of Education, Stanford University, California. Mimeograph.
- Copeland, W.D. 1975. The Relationship between microteaching and student teacher classroom performance. Journal of Educational Research. 68, 289- 293.
- Copeland, W. and Doyle, W. 1973. Laboratory skill training and student teacher classroom performance. The Journal of Experimental Education. 42, 16-21.
- Cronbach, L.J. and Furby, Lita. 1970. How we should measure 'change' - or should we? Psychological Bulletin. 74, 68-80.
- Davis, O.L. and Smoot, B.R. 1969. Effects on the verbal teaching behaviours of beginning secondary teacher candidates' participation in a programme of laboratory teaching. Paper presented at the American Educational Research Association, Los Angeles, 1969.

- Davis, O.L. and Tinsley, D.C. 1968. Cognitive objectives revealed by classroom questions asked by social studies teachers. In Hyman, R.T. (ed) 1968, Teaching: Vantage Points for Study. Philadelphia: J.B. Lippincott.
- Doty, C.R. and Cotrell, C.J. 1971. An analysis of face to face, video and remote audio feedback techniques: assessment of microteaching and video-recording in vocational and technical education. ERIC ED 052 325.
- Ebert, Marilyn J. 1970. The effect of modeling and feedback on the learning of questioning behaviours by teacher candidates in nursing utilizing a microteaching practice setting. Berkeley, University of California. Dissertation Abstracts International. 31-A;5244-5245.
- Edwards, C.H. 1975. Changing teacher behavior through self instruction and supervised micro teaching in a competency based program. Journal of Educational Research, 68, 219-222.
- Ellis, H.C. 1969. The Transfer of Learning. New York: MacMillan.
- Ely, D.P. 1976. Educational media and microteaching. Educational Media International. 2, 7-15.
- Emmer, E.I. and Millet, G.B. 1968. As assessment of terminal performance in a teaching laboratory. A pilot study. ERIC ED 055 981.
- Emmer, E.T. and Sullivan, E.H. 1969. An evaluation of a videotape modeling module: motivating strategies. Research and Development Centre for Teacher Education, University of Texas, Austin. ERIC ED 040 607.
- Erlich, O. and Shavelson, R.J. 1978. The search for correlations between measures of teacher behavior and student achievement: Measurement problem, conceptualization problem, or both? Journal of Educational Measurement. 15, 77-89.
- Fairley, J.A. 1974. The applicability of microteaching to the training of history graduates. Teaching History. 3, 347-353.
- Falus, I. and McAleese, W.R. 1975. A bibliography of microteaching. Programmed Learning and Educational Technology. 12, 34-53.
- Festinger, L. 1957. A Theory of Cognitive Dissonance. Evanston: Row, Peterson.
- Flanders, N.A. 1963 . Intent, action and feedback: A preparation for teaching. Journal of Teacher Education. 14, 251-260.
- Flanders, N.A. 1970. Analyzing Teacher Behaviour. Reading, Massachusetts; Addison-Wesley.

- Floyd, W.D. 1960. An Analysis of the Oral Questioning Activity in Selected Colorado Primary Classrooms. Colorado: Colorado State College.
- Fortune, J.C., Cooper, J.M. and Allen, D.W. 1967. The Stanford summer microteaching clinic, 1965. Journal of Teacher Education. 18, 389-393.
- Foster, J.K., Heys, T.A., and Harvey, J.M. 1973. Microteaching: A review and a study of the effect of microteaching on teaching effectiveness as measured by pupil achievement. Forum of Education. 32, 100-141.
- Fuller, F.F. and Manning, B.A. 1973. Self-confrontation reviewed: A conceptualization for video playback in teacher education. Review of Educational Research. 43, 469-528.
- Furst, Norma 1965. The effects of training in interaction analysis on the behaviour of student teachers in secondary schools. American Educational Research Association Conference Report, Chicago, USA.
- Furst, Norma, and Amidon, E.J. 1967. Teacher-pupil interaction patterns in the elementary school. In Amidon, E.J. and Hough, J.B. (eds) 1967. Interaction, Analysis: Theory, Research and Application. Chicago: Rand McNally.
- Gage, N.L. 1963. Paradigms for research on teaching. In Gage, N.L. (ed) 1963. Handbook of Research on Teaching. Chicago: Rand McNally.
- Gage, N.L. 1963. Handbook of Research on Teaching. Chicago: Rand McNally.
- Gage, N.L. 1964. Theories of teaching. In Hilgard, E.R. (ed.) 1964. NSSE Yearbook. Chicago: University of Chicago Press.
- Gagné, R.M. 1962. Military training and principles of learning. American Psychologist. 17, 83-91.
- Gagné, R.M. and Bolles, R.C. 1963. A review of factors in learning efficiency. In De Cecco, J.P. (ed) 1963. Human Learning in the School. New York: Holt, Rinehart and Winston.
- Gall, M. 1970. The use of questions in teaching. Review of Educational Research. 40, 707-720.
- Gall, M.D. 1971. Improving teachers' mathematics tutoring skills through microteaching: a comparison of videotape and audiotape feedback. ERIC ED 049 034
- Gall, M.D., Dunning, Barbara, Galassi, J. and Banks, H. 1970. Main field test report. Minicourse 9 - Thought questions in the intermediate grades. Far West Laboratory Report A 70-19.

- Gall, M.D., Dunning, Barbara, and Weathersby, Rita. 1971. Higher Cognitive Questioning Minicourse 9: Teachers Handbook. California: MacMillan Educational Services Inc.
- Gallagher, J.J. 1963. Productive thinking in gifted children. Co-operative Research Project No.965. Institute for Research on Exceptional Children, University of Illinois, Urbana.
- Gallagher, J.J., and Aschner, M.J. 1963. A preliminary report: analysis of classroom interaction. Merrill-Palmer Quarterly of Behavior and Development. July, 183-194.
- Glaser, R. 1962. Training Research and Education. Pittsburg: University of Pittsburg Press.
- Goldman, B.A. 1969. Effect of classroom experience and videotape self observation upon undergraduate attitudes towards self and toward teaching. ERIC ED 038 359.
- Goldthwaite, D.R. 1968. Study of microteaching in the preservice education of science teachers. Columbus: Ohio State University. Dissertation Abstracts International, 29-09-A, 3021. Also ERIC ED 027 184.
- Goodkind, T.B. 1968. An evaluation of effectiveness of the microteaching technique in the training of elementary school teachers. Paper read at the Annual Meeting of the American Educational Research Association.
- Goodwin, W.E. 1972. The relative effects of symbolic and symbolic-live modeling on the probing questioning behaviours of selected teacher interns. Dissertation Abstracts International 32/A/3838.
- Gormally, J., Hill, Clara E., Otis, M. and Rainey, L. 1975. A microtraining approach to assertion training. Journal of Counseling Psychology. 22, 299-303.
- Gregory, I.D. 1971. Microteaching in a pre-service educational course for graduates. British Journal of Educational Technology. 2, 24-32.
- Gregory, T.B. 1970. Teaching for Problem Solving: A Teaching Manual. (Prelim. ed.). Austin: Research and Development Centre for Teacher Education, University of Texas. ERIC ED 046 905.
- Griffiths, R. 1972a. The role of the tutor in microteaching supervision. A survey of research evidence. Department of Research Evidence. Department of Education, University of Stirling, mimeograph.
- Griffiths, R. 1972b. Some troublesome aspects of microteaching. Department of Education, University of Stirling, mimeograph.

- Griffiths, R. 1973. The future development of microteaching techniques - some possibilities. Department of Education, University of Stirling. Mimeograph.
- Griffiths, R. 1974. The contribution of feedback to microteaching technique. Department of Education, University of Stirling. Mimeograph.
- Griffiths, R. 1975. The training of microteaching supervisors: A review. British Journal of Teacher Education. 1, 191-201.
- Griffiths, R. 1976. The preparation of models for use in microteaching programmes. Educational Media International. 1, 25-31.
- Griffiths, R., McLeod, G. and McIntyre, D. 1977. Effects of supervisory strategies in microteaching on students' attitudes and skill acquisition. In McIntyre, D., MacLeod, G. and Griffiths, R. (eds) 1977. Investigations of Microteaching. London: Croom Helm.
- Guelcher, W., Jackson, T. and Necheles, F. 1970. Microteaching and teacher training: A refined version. Occasional Paper No. 1. Chicago: Teacher Education Centre, Graduate School of Education, ERIC ED 050 017.
- Guilford, J.P. 1965. Fundamental Statistics in Psychology and Education. New York: McGraw-Hill.
- Hargie, O.D.W. 1977a. The effectiveness of microteaching: A selective review. Educational Review. 29, 87-97.
- Hargie, O.D.W. 1977b. Microteaching with pre-service special education teachers. Remedial Education. 12, 22-26.
- Hargie, O.D.W., Dickson, D.A. and Tittmar, H.G. 1978. Mini teaching: An extension of the microteaching format. British Journal of Teacher Education. 4, 1-6.
- Hargie, O.D.W. and Maidment, P. 1978. Discrimination training and microteaching: Implications for teaching practice. British Journal of Educational Technology. 9, 87-93.
- Hargie, O.D.W., Tittmar, H.G., and Dickson, D.A. 1977. Extraversion - Introversion and student attitudes to microteaching: An empirical analysis. Paper presented to Irish Educational Studies Association, University College, Cork, Ireland.
- Harrington, F. 1970. Feedback techniques for in-service technical teacher education. Annual Vocational Technical Teacher Education Seminar, Leadership Series No. 25, January 1970.

- Harris, W.M., Lee, V.W. and Pigge, F.L. 1970. Effectiveness of microteaching experiences in elementary science methods classes. Journal of Research in Science Teaching. 7, 31-33.
- Hays, W.L. 1971. Statistics for Psychologists. New York: Holt, Rinehart and Winston.
- Hatton, N. and Owens, L. 1971. Telling it like it is. Education News. October 4-11.
- Hilliard, H.S. 1970. Testing the efficacy of the Far West Laboratory for Educational Research and Development Minicourse I to improve the discussion-lesson skills of 4th grade social studies teachers. Mimeograph.
- Hiscox, S. and Mondfrans, A.P., 1972. Feedback conditions and type of teaching skill in microteaching. Paper presented at the annual conference of the American Educational Research Association.
- Hoerner, J.L. 1969. An assessment of microteaching as means for improving the effectiveness of the preservice trade and industrial teacher education workshop. Ph.D. Thesis, The Ohio State University. ERIC ED 039 318.
- Hudgins, B.B. and Ahlbrand, W.P. 1967. A Study of Classroom Interaction and Thinking. St Louis: Central Midwestern Regional Educational Laboratory.
- Hunkins, F.P. 1967. The influence of analysis and evaluation questions on achievement in sixth grade social studies. Paper presented at the annual meeting of the American Educational Research Association. Chicago.
- Hunkins, F.P. 1968. The effects of analysis and evaluation questions on various levels of achievement. Paper presented at the annual meeting of the American Educational Research Association, Chicago.
- James of Rusholme, 1972. Teacher Education and Training. London: HMSO.
- Jensen, L.C. and Young, J.I. 1971. Effect of televised simulated instruction on subsequent teaching. ERIC ED 053 071.
- Jensen, R.N. 1974. Microteaching. Planning and Implementing a Competency-Based Training Program. Illinois: Charles C. Thomas.
- Jesson, C.K. 1974. An economic use of microteaching techniques to achieve objectives for a basic course in learning resources. Programmed Learning and Educational Technology. 11, 87-96.
- Johnson, W.D. 1967. Microteaching: A medium in which to study teaching. High School Journal. 51, 86-92.

- Johnson, W.D. and Knaupp, J.E. 1970. Trainee role expectations of the microteaching supervisor. Journal of Teacher Education. 21, 396-401.
- Johnson, W.D. and Pancrazion, S.B. 1971. The effectiveness of three microteaching environments in preparing undergraduates for student teaching. Paper presented to American Educational Research Association, Conference Report, New York
- Joyce, B.R. 1967. Explorations of the Utilization of Personnel in the Supervision of Student Teachers when Feedback via Films and Systems for the Analysis of Teaching are Introduced into the Student Teaching Program. New York: Teachers College, Columbia University.
- Kallenbach, W.W. 1968. The effectiveness of microteaching in the preparation of elementary intern teachers. American Educational Research Association, Conference Report.
- Kallenbach, W.W. and Gall, M.D. 1969. Microteaching versus conventional methods in training elementary intern teachers. Journal of Educational Research, 63, 136-141.
- Katz, Gwynne 1976. Use of minicourse instruction with student teachers of educable mentally retarded children. Journal of Educational Research, 69, 355-359.
- Kennedy, K. 1975. An analysis of the costs of microfilming. Research Intelligence. 1, 54-57.
- Kissok, C. McN. 1971. A study to test the value of microteaching in a program of video modeling instruction in the development of higher order questions arising on the part of pre-service teachers. Doctoral dissertation, University of Minnesota.
- Klingstedt, J.L. 1970. Effectiveness of three microteaching feedback procedures. Ed. D. Thesis. Texas Technical University. Dissertation Abstracts International, 31-A/5251.
- Klingstedt, J.L. 1976. Videotaped Microteaching: Students rate it great. Improving College and University Teaching. 29, 20-21.
- Koran, J.J. 1968. The relative effects of classroom instruction and subsequent observational learning on the acquisition of questioning behaviour by preservice elementary science teachers. Science Education Centre, University of Texas, Austin.
- Koran, J.J. 1970. The relative effects of imitation versus problem-solving on the acquisition of enquiry behavior by intern teachers. Technical Report No.11. Stanford Center for Research and Development in Teaching, Stanford University.

- Koran, J.J. 1971. A study of the effects of written and film mediated models on the acquisition of a science teaching skill by preservice elementary teachers. Journal of Research in Science Teaching. 8, 45-50.
- Koran, J.J., Koran, M.L. and McDonald, F.J. 1972. Effects of different sources of positive and negative information on observational learning of a teaching skill. Journal of Educational Psychology. 63, 405-410.
- Koran, M.L. 1969. The effects of individual differences on observational learning in the acquisition of a teaching skill. American Educational Research Association, Conference Report, Los Angeles.
- Koran, M.L., Snow, R.E., and McDonald, F.J. 1971. Teacher aptitude and observational learning of a teaching skill. Journal of Educational Psychology. 62, 219-228.
- Lange, D.N. 1971. An application of social learning theory in affecting change in a group of student teachers using video modeling techniques. Journal of Educational Research. 65, 151-154.
- Langer, P. 1969. Minicourse: Theory and strategy. Educational Technology. 9, 54-59. Also ERIC ED 028 114.
- Langer, P. 1970. Effective questioning techniques - secondary. Final Report on Minicourse 3. Far West Laboratory for Educational Research and Development, Report A70-12.
- Legge, W.B. and Asper, L. 1972. The effect of videotaped microteaching lessons on the evaluative behaviour of pre-student teachers. Journal of Teacher Education. 23, 363-366.
- Leonard, B.D., Gies, F.J. and Paden, 1971. The effect of selected media feedback upon the interactive behaviour of student teachers. Journal of Educational Research. 64, 478-480.
- Levis, D.S. 1974. An investigation of the effects of practice and feedback variation on secondary student teachers performance in selected questioning skills and attitudes within controlled teaching settings. Unpublished doctoral dissertation, Macquarie University.
- Lewis, D.G. 1972. Statistical Methods in Education. London: University of London Press.
- Light, P.J. 1973. Issues in the analysis of qualitative data. In Travers, R.M.W. (ed) 1973, Second Handbook of Research on Teaching. Chicago: Rand McNally.
- Limbacher, P.C. 1971. A study of the effects of microteaching experiences upon the classroom behaviour of social studies student teachers. ERIC ED 046 855.

- Lindop, C. 1978. Microteaching and the professional development of teachers. The Forum of Education. 37, 1-8.
- MacLeod, G.R. 1975. Microteaching: Self-confrontation revisited. Research Intelligence. 1, 46-49.
- MacLeod, G. 1977. A descriptive study of students' perceptions of their microteaching performance. In McIntyre, D., MacLeod, G. and Griffiths, R. (eds) 1977. Investigations of Microteaching. London: Croom Helm.
- MacLeod, G., Griffiths, R. and McIntyre, D. 1977. The effects of differential training and of teaching subject on microteaching skills performance. In McIntyre, D., MacLeod, G., and Griffiths, R. (eds). 1977. Investigations of Microteaching. London: Croom Helm.
- MacLeod, G. and McIntyre, D. 1977. Towards a model for microteaching. In McIntyre, D., MacLeod, G. and Griffiths, R. (eds). 1977. Investigations of Microteaching. London: Croom Helm.
- Mager, R.F. 1961. Preparing Objectives for Programmed Instruction. San Francisco, California: Fearon Publishers.
- Maidment, P. and Hargie, O.D.W. Microteaching in perspective. (at press).
- Malley, J.I. and Clift, J.C. A review and annotated bibliography of the microteaching techniques. (at press).
- McAleese, W.R. and Unwin, D. 1971. Microteaching: A selective survey. Programmed Learning and Educational Technology. 8, 10-21.
- McAleese, W.R. and Unwin, D. 1973. A bibliography of microteaching. Programmed Learning and Educational Technology. 10, 40-54.
- McDonald, F.J. 1965. Educational Psychology. Belmont: Wadsworth Publishing Company Inc.
- McDonald, F.J. 1969. A theoretical model for the use of observational learning in acquiring teaching skill. Paper presented at the meeting of the American Educational Research Association, Los Angeles.
- McDonald, F.J. and Allen, D.W. 1967. Training effects of feedback and modelling procedures on teacher performance. Stanford Centre for Research and Development in Teaching, Stanford University, California.
- McIntyre, D. 1971. Microteaching. Paper presented at British Psychological Society, Annual Conference, York.

- McIntyre, D. 1977. Microteaching practice, collaboration with peers and supervisory feedback as determinants of the effects of microteaching. In McIntyre, D., MacLeod, G. and Griffiths, R. (eds) 1977. Investigations of Microteaching. London: Croom Helm.
- McIntyre, D. and Duthie, J. 1972. Students' reactions to microteaching. Department of Education, University of Stirling. Mimeograph.
- McIntyre, D., McKnight, P.C. and White, D. (1972). Diagnostic assessment of teaching skills. University of Stirling. Mimeograph.
- McIntyre, D., MacLeod, G. and Griffiths, R. (eds). (1977) Investigations of Microteaching. London; Croom Helm.
- McPherson, J.J. 1971 . Recent developments in research on the use of audio visual media in teacher education in the United States. Educational Media International. 2, 3-10.
- Medley, D.M., Impellitteri, J.T., and Smith, L.H. 1966. Coding Teachers' Verbal Behavior in the Classroom: A Manual for Users of OScAR 4V. New York: Division of Teacher Education, City. University of New York.
- Meux, M. and Smith, B.O. 1964. Logical dimensions of teaching behavior. In Biddle, B.J. and Ellena, W.N. (eds.). 1964. Contemporary Research on Teacher Effectiveness. New York: Holt, Rinehart and Winston.
- Miller, N.E., and Dollard, J. 1941. Social Learning and Imitation. New Haven, Connecticut: Yale University Press.
- Mood, D.W. 1972. Teacher verbal behavior and teacher and pupil thinking in elementary school. Journal of Educational Research. 66, 99-102.
- Morrison, A. and McIntyre, D. 1969. (also 1973; 2nd edition). Teachers and Teaching. Harmondsworth: Penguin.
- Morse, K.R. and Davis, O.L. 1970 . Effectiveness of teaching laboratory instruction on the questioning behaviour of beginning teacher candidates. ERIC ED 037 384.
- Morse, K.R. et al. 1970 . Effects of different types of supervisory feedback on teacher candidates' development of refocusing behaviours. ERIC ED 046 906.
- Mowrer, O.H. 1960. Learning Theory and Behavior. New York: Wiley.
- Murray, C.K. and Fitzgerald, R. 1971 . The effect of video taped modeling procedures on the verbal behaviors of student teachers. Final Report. ERIC ED 055 038.
- Murray, C.K. and Williams, T.L. 1971. The effect of cognitive instruction on secondary and English student teachers and their pupils. Paper presented at the annual meeting of the American Educational Research Association, New York.

- Nuthall, G. 1972. . A comparison of the use of microteaching with two types of pupils - 10-year old pupils, and peers acting as pupils. Paper presented to International Microteaching Symposium, Universitat Tubingen, West Germany.
- Nuthall, G.A. and Lawrence, P.J. 1965. Thinking in The Classroom: The Development of a Method of Analysis. Wellington, New Zealand: New Zealand Council for Educational Research.
- Olivero, J.L. 1965. The use of video recordings in teacher education. ERIC ED 011 074.
- Olmo, B.G. 1973. . Report on a co-operative student teaching program: A pilot study. Journal of Experimental Education. 41, 89-92.
- Orme, M.E.J. 1966 . The effects of modelling and feedback variables on the acquisition of complex teaching strategy. Ph.D. Thesis. Stanford University, California.
- Orme, M., McDonald, F.J. and Allen, D.W. 1966 . The effects of modelling and feedback variables on the acquisition of complex teaching strategy. ERIC ED 014 441.
- Parry, G. and Gibbs, I. 1974. . A bibliography of supervision. Programmed Learning and Educational Technology. 11, 97-111.
- Patrick, J.M. 1972. A comparison of the use of microteaching with two types of pupils - 10 year old pupils, and peers acting as pupils. University of Canterbury, New Zealand. Mimeograph.
- Peatman, J.G. 1964. Introduction to Applied Statistics. New York: Harper and Row; Weatherhill.
- Peck, R.F. and Tucker, J.A. 1973. Research on teacher education. In Travers, R.M.W. (ed). 1973. Second Handbook of Research on Teaching. Chicago: Rand McNally.
- Peck, R.F. and Tucker, J.A. 1971 . Research on teacher education. Austin, Texas: R. and D. Centre for Teacher Education, University of Texas.
- Pereira, P. and Guelcher, W. 1970. . The skills of teaching: A dynamic approach. ERIC ED 049 162.
- Perlberg, A. 1969 . The use of portable video recorders and microteaching techniques in supervision of vocational technical student teachers. Journal of Industrial Teacher Education. 7, 38-45.
- Perlberg, A. 1970 . Microteaching: A new procedure to improve teaching and training. Journal of Educational Technology. 1, 35-43.
- Perlberg, A. 1975 . Recent approaches on microteaching and allied techniques which can be implemented easily in developing countries. U.N.E.S.C.O. Paris.

- Perlberg, A. 1976 . Microteaching - present and future directions. Educational Media International. 2, 13-20.
- Perrott, E. 1972. . Course design and microteaching in the context of teacher training. Paper presented to International Micro Teaching Symposium, Universitat Tubingen, West Germany.
- Perrott, E. 1974 . A study of self-instructional microteaching systems. Educational Development International. 2, 19-25.
- Perrott, E. 1976a . The international transfer of individualized teacher training programmes involving the use of television. Educational Broadcasting International. 9, 61-65.
- Perrott, E. 1976b . Changes in teaching behaviour after participating in a self-instructional microteaching course. Educational Media International. 1, 16-25.
- Perrott, E. 1977 . Microteaching in Higher Education: Research, Development and Practice. Surrey: Society for Research into Higher Education Ltd.
- Perrott, E., Applebee, A.N., Watson, E. and Heap, B. 1975: A Self-Instructional Microteaching Course on "Effective Questioning". Peterborough: Guild Sound and Vision.
- Perrott, E., Applebee, A.N., Heap, B. and Watson, E.P. 1976 . An investigation into teachers' reactions to a self-instructional microteaching course. Programmed Learning and Educational Technology. 13, 25-35.
- Perrott, E. and Duthie, J.H. 1969 . Microteaching. University Television Newsletter, No.7. University of Stirling, Scotland.
- Perrott, E. and Duthie, J. 1970 . Television as a feedback device: Microteaching. Educational Television International. 4, 258-261.
- Peterson, T.L. 1973 . Microteaching in the preservice education of teachers: Time for a re-examination. Journal of Educational Research. 67, 34-36.
- Popham, W.J. 1966. . Instructional video-tapes in teacher education. A.V. Communication Review. 14, 371-376.
- Ragosta, Marjorie et al. 1971. Sign versus category: Two instruments for observing level of thinking. Paper presented at the annual meeting of the American Educational Research Association. New York, 1971.
- Rezler, A.G. and Anderson, A.S. 1971. . Focused and unfocused feedback and self-perception. Journal of Educational Research. 65, 61-64.

- Rogers, Virginia M., and Davis, O.L. 1970. Varying the cognitive levels of classroom questions: An analysis of student teachers' questions and pupil achievement in elementary social studies. Paper presented at the annual meeting of the American Educational Research Association, Minneapolis. 1970.
- Rosenshine, B. 1971. Teaching Behaviours and Student Achievement London: National Foundation for Educational Research.
- Rosenshine, B. and Furst, Norma. 1971. Research on teacher performance criteria. In Smith, B.O. (ed). 1971. Research in Teacher Education: A Symposium. Englewood Cliffs N.J.: Prentice-Hall Inc.
- Ryans, D.G. 1960. Characteristics of Teachers: Their Description, Comparison and Appraisal. Washington, D.C.: American Council on Education.
- Sadker, M. and Sadker, D. 1975 . Microteaching for affective skills. Elementary School Journal. 76, 91-99.
- Sanders, N.M. 1966. Classroom Questions - What Kinds? New York: Harper and Row.
- Schreiber, J.E. 1967. Teachers' question-asking techniques in social studies. Doctoral dissertation, University of Iowa.
- Schuck, R.F. 1971 . Microteaching in teacher education programs. Association of Teacher Educators Research Bulletin, 9. Washington, D.C.
- Shea, J. 1971. The relative effectiveness of student teaching versus a combination of student teaching and microteaching. Report No.A71-21, Teacher Education Division Publication Series, Far West Laboratory for Educational Research and Development. Berkeley, California.
- Sheffield, F.D. 1961. Theoretical considerations in the learning of complex sequential tasks from demonstration and practice. In Lumsdaine, A. (ed.). 1961. Student Response in Programmed Instruction: A Symposium. Washington D.C.: National Research Council.
- Shively, J.E. Van Mondfrans, A.P. and Reed, C.L. 1970 . The effects of mode of feedback in microteaching. ERIC ED 037 391.
- Siegal, S. 1956. Nonparametric Statistics for the Behavioral Sciences. New York: McGraw-Hill.
- Skinner, B.F. 1954. The science of learning and the art of teaching. Harvard Educational Review. 24, 100.
- Smith, B.O. 1967 . Recent research on teaching: an interpretation. High School Journal. 51, 63-73.

- Smith, B.O. et al. 1969 . Teachers for the Real World.
Washington: The American Association of Colleges for Teacher Education.
- Smith, B.O. and Meux, M. 1962. A Study of the Logic of Teaching.
Illinois: University of Illinois Press.
- Soar, R.S. 1966. An integrative approach to classroom teaching.
Philadelphia: Temple University. ERIC ED 033 479.
- Sparks, R.L. and McCallon, E.L. 1974 . Microteaching: Its effect on student attitudes in an elementary science methods course. Science Education. 58, 483-487.
- Spelman, B.J. and St. John-Brooks, Caroline 1972. Microteaching and teacher education: A critical reappraisal. Irish Journal of Education. 6, 73-93.
- Staley, F.A. 1970 . A comparison study of the effects of pre-service teachers presenting one or two microteaching lessons to different sized groups of peers on selected teaching behaviours and attitudes in an elementary science methods course. Michigan State University. Dissertation Abstracts International, 31-A/5916-7.
- Steinbach, A. and Butts, D.P. 1968. A comparative study of the effect of practice with elementary children or with peers in the science methods course. R. and D. Centre for Teacher Education. Report series No.10. University of Texas.
- Stevens, R. 1912. The Question as a Measure of Efficiency in Instruction. (Contributions to Education No.48) New York City: Teachers College, Columbia University.
- Stones, E. and Morris, S. 1972 . Teaching Practice: Problems and Perspectives. London: Methuen.
- Stowitschek, J.J. and Hofmeister, A.M. 1974. Effects of Minicourse instruction on teachers and pupils. Exceptional Children. 40, 490-495.
- Thorndike, E.L. 1913. Educational Psychology. (Vol.II) The Psychology of Learning. New York: Teachers College, Columbia University.
- Tisher, R.P. 1970. The nature of verbal discourse in classrooms and associates between verbal discourse and pupils' understanding in science. In Campbell, W.J. (ed). 1970. Scholars in Context: The Effects of Environments on Learning. Sydney: Wiley.
- Travers, R.M. (ed) 1973. Second Handbook of Research on Teaching
Chicago: Rand McNally.
- Tuckman, B.W. and Oliver, W.F. 1968 . Effectiveness of feedback to teachers as a function of source. Journal of Educational Psychology. 59, 297-301.

- Turney, C. 1970 . Microteaching: A promising innovation in teacher education. Australian Journal of Education. 14, 125-141.
- Turney, C., Cairns, L., Williams, G. and Hatton, N. 1973a . Sydney Micro Skills. Series I Handbook. Reinforcement, Basic Questioning, Variability. Sydney: Sydney University Press.
- Turney, C., Cairns, L.G., Williams, G., Hatton, N. and Owens, L.C. 1975 . Sydney Micro Skills - Explaining, Introductory Procedures and Closure, Advanced Questioning. Sydney: Sydney University Press.
- Turney, C. and Cairns, L.G. 1976. . Sydney Micro Skills - Classroom Management and Discipline. Sydney: Sydney University Press.
- Turney, C., Clift, J.C., Duncan, M. and Traill, R.D. 1973b. Microteaching: Research Theory and Practice. Sydney: Sydney University Press.
- Turney, C., Renshaw, P. and Sinclair, K.E. 1977 . Sydney Micro Skills - Learning and Fostering Creativity. Sydney: Sydney University Press.
- Turney, C., Thew, D.M., Owens, L.C., Hatton, N. and Cairns, L.G. 1976 . Sydney Micro Skills - Guiding Small Group Discussion. Small Group Teaching and Individualized Instruction. Sydney: Sydney University Press.
- Wagner, A.C. 1973 . Changing teaching behaviour: A comparison of microteaching and cognitive discrimination training. Journal of Educational Psychology. 64, 299-305.
- Waimon, M.D. and Ramseyer, G.C. 1970 . Effects of video feedback on the ability to evaluate teaching. Journal of Teacher Education. 21, 92-95.
- Wallen, N.E. 1966. Relationships between Teacher Characteristics and Student Behavior. Salt Lake City: University of Utah.
- Ward, B.E. 1970. A survey of microteaching in secondary education programmes of all N.C.A.T.E. accredited colleges and universities. ERIC ED 046 894.
- Webb, C. and Baird, R. 1968 . Description of a large scale microteaching programme. College of Education, Brigham Young University, Utah. ERIC ED 027 250.
- White, F.J. 1972 . Observational learning of indirect verbal behaviour through the medium of audio tapes. Journal of Educational Research. 65, 417-419.
- Wilson, J.H. 1969. The "new" science teachers are asking more and better questions. Journal of Research in Science Teaching. 6, , 49-53.
- Winer, B.J. 1970. Statistical Principles in Experimental Design. London: McGraw-Hill.

- Wood, C.C. and Hedley, R.L. 1968. Training Instruction Practice Sessions (TIPS): Observations on student reaction to the use of video-tape recordings (VTR) in simulated classroom situations. Canadian Education and Research Digest (now Education Canada). 8, 46-59.
- Wood, S.E. 1970. A multidimensional model for the observation, analysis and assessment of classroom behavior. Journal of Research and Development in Education. 4, 84-97.
- Wragg, E.C. 1971. The influence of feedback on teachers' performance. University of Exeter, England. Mimeograph.
- Wright, C.J. and Nuthall, G. 1970. Relationships between teacher behaviors and pupil achievement in three experimental elementary science lessons. American Educational Research Journal. 7, 477-491.
- Yorke, D.M. 1977. Television in the education of teachers - a case study. British Journal of Educational Technology. 8, 131-141.
- Young, D.A. and Young, D.B. 1969. Effectiveness of individually prescribed microteaching training modules on an intern's subsequent classroom performance. ERIC ED 030 586.
- Young, D.B. 1968. Effectiveness of self-instruction in teacher education using modelling and videotape feedback. Paper presented to the Meeting of the American Educational Research Association, Chicago.
- Young, D.B. 1969. Modification of teacher behaviour using audio video-taped models in a microteaching sequence. Educational Leadership. 26, 394-403.
- Young, J.I., Blaine, N.L. and Richards, D.R. 1971. The effect of controlled variables in microteaching. ERIC ED 050 557.