THE RELATIVE EFFECTIVENESS OF DIFFERENT FORMS OF MICROTEACHING INCORPORATING A SENSITISATION APPROACH

A thesis

submitted for the Degree

of

Doctor of Philosophy in Education

at the

University of Waikato

by

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University of Waikato

1977

ABSTRACT

This study examined the relative effectiveness of several different forms of microteaching as compared with equivalent courses in observation-analysis of teaching and regular pre-service study in the principles of teaching. The microteaching courses incorporated a sensitisation, rather than a skills-training, approach and emphasised the usefulness of various questioning strategies and the development of sensitive and flexible control of a repertoire of questioning skills. The subjects were 96 student teachers in the primary school division of a New Zealand Teachers College.

Three sets of treatments were studied as interrelated parts of an overall research design. First, an examination was made of the relative effects on teaching performance of microteaching, observation-analysis and regular coursework. Secondly, comparisons were made of the effects of different media (video and audiotape) in the microteaching and observation-analysis programmes. Thirdly, a study was made of the relative effects of microteaching treatments involving different "pupils" (children or student teacher peers), different media (video or audiotape), different question types to be practised (middle or high order), and various combinations of these treatments.

Data on subjects' cognitive questioning skills and talk patterns were obtained by analysing transcripts of discussion lessons taken before and after treatment. The overall and differential effects of treatments in each research design on these behavioural variables were tested by the use of correlated t tests, and analysis of variance and covariance procedures, respectively. In addition, the reaction of microteaching and observation-analysis participants to their learning experiences was investigated by means of opinion questionnaires.

Observation-analysis and regular coursework both produced some significant changes in teaching performance. Microteaching,

however, was significantly more effective than either of these two treatments in helping student teachers to increase fluency-control in questioning, to develop fewer but more searching discussion episodes through the use of high order initial and probing questions, to decrease the amount of teacher talk, and to minimise questioning that leads to simple yes/no answers. Microteaching also appeared superior to regular coursework in reducing the tendency to repeat pupil responses, and in increasing unsolicited pupil answering and pupil-to-pupil dialogue. A similar pattern of results favouring microteaching was evident in comparisons made between the two media treatments in microteaching and observation-analysis, and between these treatments and regular coursework.

The most striking findings in the study, however, were the equivalent effects overall of the different pupil, media and question type treatments in microteaching, and of the various combinations of these treatments. In the development of questioning skills in the small group discussion situation, these results suggest that a Teachers College might reduce the logistic, resource and time problems in the provision of microteaching by having students: (i) teach their peers instead of children; (ii) use audio-tape instead of videotape to support analysis of teaching and feedback activities; and (iii) practise some types of questions only while learning to use other questioning skills 'vicariously' through observing them being used by fellow microteachers.

ACKNOWLEDGEMENTS

I am indebted to a number of people whose willing cooperation and assistance made this investigation possible. In particular, I would like to record my sincere gratitude to:

Professor P.S. Freyberg, my research adviser and Director of the Teacher Education Research Project at the University of Waikato, who was principally responsible for stimulating me to develop the study, and whose encouragement, guidance and constructive criticism have been immeasurably helpful.

J.S. Allan, Principal of the Hamilton Teachers College, for his interest in, and support of, the study.

N. Haigh, friend and colleague, for his encouragement, thoughtful criticisms and professional stimulation.

Dr. G. Durling and Dr. P. Hill of the Mathematics Department at the University of Waikato, for their guidance on research design and statistical analysis.

W. Rogers, doctoral student in mathematics and formerly a programmer in the University of Waikato Computer Centre, for his counsel on research design, statistical analysis and computer programming.

A. McGougan of the Education Department at Hamilton Teachers College, who generously agreed to undertake the investigator's administrative and teaching duties during the latter part of 1973 in order that laboratory materials might be prepared and piloted.

Student teachers in the 1972-74 Intake at Hamilton Teachers College who participated as subjects in the various treatment groups in the study.

G. Bourne, technician at the University of Waikato, whose advice on videotape production and servicing of equipment

were valuable contributions to the study.

B. Hill and D. Mundell, Research Fellows in the Teacher Education Research Project at the University of Waikato, for their help in preparing curriculum materials, with pre- and post-testing, and with the supervision of treatment groups.

Judith Findlay, N. Hanlon and D. Mundell for their able assistance in coding transcripts of pre- and post-test lessons.

Gladys Bromell, Barbara Hill, Liz Hamilton, A. Kerr, H. Meek and O. Sutherland, associate teachers of the Hamilton Teachers College, who provided teaching samples on videotape and audiotape for the microteaching and observation-analysis programmes that were developed.

G. Spurway, Principal of Knighton Normal School, and the teaching staff and pupils of the Standard 3/4 division, for their willing assistance with microteaching sessions which were conducted in their school.

The Principals, teachers and pupils in associate schools of the Hamilton Teachers College who assisted with the pre- and post-testing phases in the study.

And to my wife, Verna, and daughter, Fleur, without whose patience to endure my labour, encouragement and help with numerous clerical tasks, I could never have completed the research undertaken.

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CHAPTER 1

INTRODUCTION

The Research Problem and Related Background

There is substantial empirical evidence from American and British research that the traditional teacher education programme, with its two major components of coursework in education and practice teaching in schools, has only a limited effect on the subsequent classroom behaviour of student teachers (Berliner, 1969; Morrison and McIntyre, 1969, Stones and Morris, 1972a; McNamara, 1973). In particular, this type of programme does not seem to provide sufficient help for students to develop that flexible control of teaching strategies which stems, in good part, from applying theoretical knowledge to the interpretation of classroom events; nor does it help them to create new teaching procedures when established habits prove to be inadequate (B.O. Smith *et al.*, 1969).

Several reasons may be advanced for the apparent ineffectiveness of the traditional approach to teacher education, and all of them contribute to the often discussed dichotomy between theory and practice in teaching.

First, coursework in education theory and curriculum methods tends to be highly verbal, abstract and indirect in nature. There is insufficient tying of the professional studies lecture programme to first-hand, or even simulated, teaching experiences which involve student teachers in the typical decision-making problems of the classroom practitioner, and which give them opportunities to test their ability in translating theoretical knowledge into practical terms (B.O. Smith *et al.*, 1969; Goddu and Durchame, 1971; Goodlad, 1972). As La Grone has pointed out, too often the teacher educator makes the unwarranted assumption that the student teacher "will put together the

talk about education and his teaching" (La Grone, 1964: p.63).

Secondly, the apprenticeship orientation of much of the school practice programme limits student teacher opportunity to test alternative theoretical ideas, methods and teaching styles essential for developing teaching competence (Stolurow, 1965; Perlberg, 1970). This "master the master teacher" approach to practice teaching is especially restrictive regarding the exploration of innovative teaching procedures. Moreover, even within the constraints of modelling the supervising teacher, opportunities for student teachers to develop teaching competence are hindered further by a tendency for supervisory feedback on their classroom performances to be irregular, unfocused and superficial (Berliner, 1969).

A third impediment to the success of the traditional pre-service programme for teachers is its inability to provide clear direction concerning what qualities or behaviours make a 'good' teacher. There is little uniformity amongst the criteria of effective teaching used by different teacher education institutions, or, for that matter, by individual lecturers and supervising teachers within the one programme (Stones and Morris, 1972a, 1972b). This reflects varying interpretations of the literature on pedagogy, as well as differences of opinion based on classroom experience. It also reflects different value positions -- not always conscious or able to be made explicit -- concerning competing ideologies about the nature of man, education and schooling. Joyce (1975), for example, has pointed to the conflicting views that can arise from the influence in contemporary teacher education programmes of what he calls the industrial-economic, progressivistic, academic and humanistic philosophies.

Unfortunately, educational research has been of little help to teacher educators in solving this student direction problem. Several decades of research has gradually unveiled some of the complexities of the teaching process, but has failed to identify any single teaching method, set of teaching skills, or list of personality traits whose superiority can be empirically established (Ryans, 1960; Gage, 1963, 1968; Rosenshine, 1971; Gage, 1972; Gall, 1973; Heath and Nielson, 1973; Dunkin and Biddle, 1974; Dunkin, 1976). Indeed, as yet there is no comprehensive theory of teaching; nor are there any generally accepted criteria for judging teacher effectiveness.

Lack of consensus on the nature of effective teaching means that

student teachers often experience conflicting guidance on which particular behaviours they should try to develop. Their response to this situation varies, but it often includes mistrust of the theory-practice relationship, reluctance to attempt innovative teaching procedures, and an extolling of the apprenticeship experience in schools as a "professional life-line". Those students who become extremely confused may seek security by indiscriminately imitating any 'impressive' teaching behavour that they have been able to observe, or they may simply fall back on teaching in the way that they, themselves, were taught in school.

Problems in the Hamilton Teacher Education Programme

Problems similar to those described above have also been identified in this country and discussed in the reports of a Consultative Committee (1951) and a Commission on Education (1962). In recent years, therefore, Teachers Colleges have attempted to focus more upon the education of the prospective teacher as a professional decision-maker, and have reduced the emphasis on training along apprenticeship lines. As a result, general theory and curriculum methods courses have increasingly emphasised deeper understanding of theoretical principles, and then attempted the transfer of these to actual teaching behaviour in the classroom setting.

The present study concerns the pre-service course for primary school teachers at Hamilton Teachers College where an attempt has been made to develop a coordinated professional studies programme, the focal point for which is the Studies in Teaching (Curriculum) component. The purpose of this component is "to bring together in the one context the factors most relevant for influencing teaching judgments and influencing teaching behaviour" (J.S. Allan, 1967: p.5).

To support the coordination of its Studies in Teaching provision with all education theory courses and school practice, the Hamilton programme endeavours to help students formulate a set of principles that are basic to the planning, teaching and evaluation process. These principles are meant to be developed at an elementary level early in the programme, with more sophisticated understanding and application emerging through (i) ongoing coursework in education theory and a selected range of curriculum areas; (ii) support of this coursework by observation and small group teaching in Normal schools;

and (iii) several periods of full-time practice teaching in cooperating schools. Essentially, then, the Hamilton programme "tries to teach for transfer of learning through the development and application of principles" (J.S. Allan, 1967: p.7).

Efforts at Hamilton Teachers College to move from just training students in teaching techniques to educating them to become more flexible and insightful teachers have been only partially successful. The present writer and other staff members have noted that many students still tend to model uncritically the teaching behaviour of supervising teachers in the college's cooperating schools, and have developed only a global appreciation of a narrow range of methods and teaching skills. In addition, they still lack sensitivity to the varying effects of different teaching behaviours and cannot yet flexibly adapt to the demands of specific interactive situations.

The reasons for these difficulties are undoubtedly complex. However, amongst a number of claimed programme weaknesses which have been referred to in both informal and more systematic evaluations over several years, the most commonly mentioned is the need for more practice teaching. There is a feeling amongst many students and staff that, in pursuing the ideal of theory-based teaching, the programme has tended to over-emphasise verbal and theoretical learning while under-emphasising application experiences. Thus, many student teachers claim that the observation and practice activities which accompany coursework are too infrequent. Furthermore, they state that the link between theoretical knowledge and classroom practice is weakened by: (i) the tenuous relationship between theoretical courses and the Studies in Teaching course; (ii) conflicting views on the nature of effective teaching amongst individual staff in both the college and cooperating schools; and (iii) lack of opportunity to explore ideas on an independent basis during school practice.

From these evaluations it appeared to the present investigator that the Hamilton programme continued to exhibit many of the shortcomings of the traditional teacher education programme touched upon above. Clearly, measures needed to be taken to counteract the leanings of some supervising teachers towards the apprenticeship point of view during school practice. Again, better coordination of all education theory and curriculum courses was required if the desirable notion of principles of teaching as the focal point for the programme

were to remain viable. In terms of immediate impact on student teacher attitudes and teaching competence, however, the key problem seemed to be how to bridge the imbalance and the gap between direct and indirect experiences during coursework without prejudicing a theory-based approach to teaching.

Microteaching as a Solution

The procedure known as microteaching was seen as one possible solution to this problem. Indeed, as originally developed at Stanford University in the early 1960s, microteaching had been designed specifically to overcome some of the difficulties related to coursework, practice teaching and defining teacher effectiveness which beset the traditional teacher education programme (Allen and Ryan, 1969).

An essential feature of the Stanford model of microteaching is the learning of specific skills through concentrated practice in a situation of reduced pedagogic complexity. Thus the student teacher participates in a scaled-down teaching situation in which the teaching content, teaching time, and the size of the pupil group are all reduced so that the number and variety of different factors which influence the outcomes of his teaching efforts are more easily controlled. Fundamentally, this involves a behaviouristic training procedure: the teaching act is analysed into component skills, each of which is deemed to contribute to effective teaching; performance of each skill is then established separately through a learning sequence incorporating videotape modelling, direct imitative practice, and videotape feedback accompanied by supervisor reinforcement; and, in subsequent classroom teaching, the student teacher attempts to make different syntheses of his separately acquired skills in relation to specific teaching situations.

Theoretical and practical problems in this atomistic type of approach, however, prejudiced its use in the Hamilton Teachers College programme. From a theoretical point of view, there were two major areas of concern:

1. The assumption that effective teaching behaviour (including the development of a personal style of teaching) can be learned by dividing the teaching act into behavioural sub-components or skills, and practising these separately in conformity with

standardised models.

2. The assumption that the specific skills practised during microteaching are indeed those which are most basic to effective teaching, and that increasing the frequency of use for particular skills denotes improved teaching competence.

Typically, teaching involves an attempt to implement a planned overall teaching strategy related to one or a combination of teaching modes (for example, guided discovery, group discussion and exposition, to mention but a few). This overall strategy is made up of a sequence of tactics or sub-strategies, each of which comprises a group of interrelated teaching behaviours. Interactive teaching, however, does not consist of just "slotting in" planned tactical sequences -- or the specific teaching moves that each includes -- in a linear, lock-step fashion. The actual course of a particular teaching session will be only partly determined by the various planned behaviour patterns adopted by the teacher to achieve his goal of pupil learning. In accordance with his observation and interpretation of changing conditions in the teaching-learning environment, the teacher will often introduce new patterns of teaching behaviour as alternative possible paths to his teaching goals, and will sometimes need to alter both these goals and his overall strategy.

Clearly, then, teaching is an extremely complex activity involving continual professional decisions on the teacher's part and continuous interaction of teacher, pupil, task and situational variables. Indeed, educational research is only just beginning to reveal the extent of this complexity and the possible significance of particular variables for influencing pupil achievement (c.f. Rosenshine, 1971; Gall, 1973; Heath and Nielson, 1973). On theoretical grounds, therefore, it was difficult to see how any atomistic approach to microteaching could handle the question of interaction amongst all the variables involved in various teaching situations. If anything, it seemed that skill-by-skill training which is based on a particularistic analysis of the teaching act might indeed prevent student teachers from developing sensitive and flexible response to the highly complex patterns of behaviour which occur in the classroom.

These problems led Freyberg and the present investigator (Freyberg and Katterns, 1971; Freyberg *et al.*, 1974) to propose that

the real value of microteaching for developing teaching competence may well lie in its increasing the sensitivity of teachers to the complex interactions of factors in a variety of teaching situations, rather than in the opportunity for practice of specific skills.[1] To this end, these researchers have regarded exploring and evaluating the appropriateness of alternative patterns in overall teaching strategy, as well as alternative move patterns within tactics or sub-strategies, as probably being the best focus for microteaching. This kind of experience reflects the behaviour of the competent teacher who, it can be argued, is conducting this exploratory, evaluative and adaptive process almost intuitively as his teaching proceeds (c.f. Strasser, 1967; Smith and Geoffrey, 1968).

On the practical side, the problems of an atomistic approach to microteaching appeared to be overwhelming. Even without adopting the procedure of training to some criterion level, the provision of modelling/practice/feedback sequences for all of the skills which may be significantly related to pupil achievement and attitude towards learning would involve excessive instructional time, make inordinate demands upon pupil supply, and be an almost impossible logistic task for any teacher education institution. In addition, the videotape resources required to mount a large-scale microteaching programme would be beyond those available in most, if not all, New Zealand Teachers Colleges.

Purposes of the Study

Except for a few instances (see, for example, Siedman, 1969; Freyberg and Katterns, 1971; Beattie and Teather, 1972; Freyberg *et al.*, 1974), researchers and teacher eductors have made few attempts to view microteaching from other than a behaviouristic standpoint. In the light of the theoretical problems that this approach presents, however, it was felt that if microteaching were to become an integral part of the professional studies programme at Hamilton Teachers College, it

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1 Sensitivity in this context is defined as "... a teacher's receptiveness to the perception of subtle changes in the pedagogical situation, with the subsequent possibility of modifying his teaching behaviour to cope with these changes" (Freyberg *et al.*, 1974).

might best take the form of a sensitisation experience. It was decided, therefore, to develop a conceptual model for this kind of approach and to conduct an experimental investigation of the efficacy of a programme based on this model (see Chapters 2 and 4 respectively). The programme had to provide student teachers with:

(i) clear guidelines concerning the problem of defining for themselves the nature of teaching competence;

(ii) a relatively 'safe' environment in which they could personally devise and explore alternative ways of combining teaching skills into strategies, as well as being able to discuss the theoretical ideas underlying their teaching attempts; and

(iii) opportunities for focused feedback on their teaching performance to encourage them to analyse and self-evaluate their teaching, as well as to prescribe alternative behaviour patterns for themselves.

At the same time, it seemed important to investigate possible ways of overcoming the logistic, resource and instructional time problems that would be likely to attend any large-scale implementation of this type of microteaching programme. In this regard, a review of the research literature (see Chapter 3) suggested that worthy of investigation would be:

(i) the relative effectiveness of microteaching student teacher peers versus the microteaching of school pupils;

(ii) the relative effectiveness of using audiotape versus using videotape to support a microteaching programme;

(iii) organising a microteaching programme so that student teachers might develop teaching competence not only through deliberate practice, but also through 'vicarious' learning from observing the performance of fellow microteachers; and

(iv) the relative effectiveness of microteaching versus observation-analysis of teaching without practice opportunities.

It was hoped that this study would provide evidence favouring one or other form of microteaching sufficient to warrant the design of

further sensitisation programmes which would become an integral part of the professional studies course at Hamilton Teachers College. Eventually, such programmes might operate in both the college and cooperating school settings, thus providing an important avenue whereby students, college staff and supervising teachers would perceive themselves as pursuing common objectives.

Limits of the Study

The investigation of microteaching in the present study was, of necessity, subject to certain limits. First, for reasons of manageability and experimental control, microteaching experience was restricted to one type of teaching situation only, namely, the small group discussion lesson in which the teacher employs questioning strategies to help pupils achieve cognitive learning objectives.

A second limitation concerned the fundamental question of how to assess the effectiveness of various experimental treatments. One possible criterion measure was the degree to which different treatments helped student teachers increase pupil achievement. However, this process-product orientation was impracticable because arrangements could not be made for students to teach the same group of pupils in the pre- and post-test phases of the study. Thus the research undertaken was necessarily of the process-process type. That is, it was concerned with the effects of differing treatments on student teachers' performance of selected patterns in teaching behaviour.

Overview of the Study

Besides this introductory chapter and the concluding chapter which summarises the study and its implications, this report comprises seven chapters broadly corresponding to the sequence of steps that were followed in conducting the research.

Chapter 2 provides a critical examination of the behaviouristic orientation of the Stanford model of microteaching, and elaborates on the sensitisation model which has been touched upon earlier in this chapter.

Chapter 3 presents a review of the research literature on microteaching in order to identify factors which might contribute to the effectiveness of the procedure, as well as areas in need of further investigation. The emphasis in this review on behaviouristically-oriented microteaching programmes reflects the strong influence of the Stanford model. Nevertheless, studies are also examined which seem to support the view of microteaching as a sensitisation experience.

Chapter 4 provides an outline of the microteaching programme that was used in the study, emphasising its points of departure from programmes adopting the Stanford model.

Chapter 5 presents the specific questions that were researched, and details the independent and dependent variables upon which the experimental hypotheses in the study were based.

In Chapters 6 and 7, details are given of the research methodology. Chapter 6 focuses on the research design, while Chapter 7 describes the data collection and measurement procedures that were followed.

The report section concludes with the presentation and discussion of the research results in Chapter 8.

CHAPTER 2

MICROTEACHING: FROM A BEHAVIOURISTIC TO A SENSITISATION MODEL

OUTLINE: The behaviouristic orientation of the original Stanford model of microteaching is analysed with special reference to two of its main features: the component skills approach and the use of modelling and reinforcement procedures. In the critical appraisal which follows, discussion highlights misconceptions about the effectiveness of the Stanford component skills of teaching, the Stanford model's limited perspective concerning teaching as a complex decision-making process, and the possibility that this model may impede rather than nurture professional growth. The final section in the chapter outlines an alternative model which views microteaching as a sensitisation experience. This model formed the basis of the microteaching programme that was used in the present study.

Microteaching originated within the teacher education programme at Stanford University during summer schools held in the early 1960s. Needing to prepare liberal arts graduates in a short space of time for their internship in secondary schools, the staff at Stanford sought a more effective training approach than the traditional pattern of lectures on the theory and practice of teaching supplemented by classroom observations and school practice along apprenticeship lines. The procedure of microteaching provided them with a solution. It permitted the implementation of five propositions which centred on greater direction and control of practice teaching, as well as on the integration of this experience with theoretical ideas presented during coursework. The five propositions were:

1. "That a genuine teaching experience is superior to an artificial one.
2. That the complexity of the normal classroom severely limits its training value for a beginning teacher.
3. That concentrated practice of a specific skill is the most effective way to master that skill.

4. That a training vehicle capable of wider variation according to specific purposes is superior to a rigid one.
5. That the more knowledge a trainee has of his performance during a practice session, the more valuable that practice session will be for him."

(Allen *et al.*, 1969: pp.1-2)

As it developed at Stanford, microteaching provided training opportunities through what was termed the Teach/Critique/Reteach Cycle. First of all, a group of student teachers and a supervisor would discuss the behavioural features of a particular teaching skill and then view several videotape presentations of its use by teacher models. Next, the students would concentrate on the practice of this skill during a five to fifteen minute lesson with a small group of pupils, each of these lessons being videotaped and replayed in order that the supervisor, peers, and sometimes the pupils, could provide feedback on the teaching performance. Finally, each student would make use of this feedback when attempting to improve and refine his application of the skill in a reteach session with a different group of pupils.

At Stanford, microteaching was soon regarded as an important complement to the professional studies lecture programme and as a necessary preliminary experience to regular practice teaching in schools. In emphasising the development of teaching competence on a one-skill-at-a-time basis, microteaching incorporated certain training features not readily available through conventional school practice:

1. Efficient and effective use of modelling. Unlike classroom observation *in vivo*, videotaped models permitted a high degree of control over the teaching skills that were presented. This was achieved through the use of "competent" teachers only, the prescription of performance criteria, the exaggeration of skills, the use of cueing techniques to focus attention on relevant stimuli, and editing to eliminate irrelevant or distracting events.

2. Distributed practice in a 'safe' environment. Because it was scaled down in terms of time, teaching content, class size and the teaching behaviour practised, microteaching provided a less complex and less threatening environment in which student teachers could attempt to gain mastery of the specific sub-skills of teaching.

Moreover, in contrast to the mass practice of many teaching behaviours within the one lesson which characterises conventional school practice, the micro-approach permitted (if desired) the distributed practice of individual skills with a variety of pupil age-groups and abilities.

3. Effective use of feedback. Microteaching replaced the periodic, delayed and subjective feedback that typifies conventional practice teaching with feedback that was regular, fairly immediate and specifically focused. This improved feedback was made possible by the videotape replay of a microteaching performance: comparisons could be made between a student teacher's use of a particular teaching skill and the performance of a previously studied model; supervisor reinforcement could be made immediately contingent upon actual instances of appropriate use of a skill; and, although subjective rating scales were still employed, it was possible to derive a more objective assessment of improvement in teaching performance by keeping records of increases in the frequency with which students used particular skills.

Microteaching and Behaviourism

According to McDonald (1973) the development of microteaching at Stanford University was a by-product of a research programme on behaviour modification which had two main objectives: (i) To provide efficient training of student teachers in specific teaching skills by the application of behavioural control techniques, and (ii) to create a viable experimental paradigm for training studies in which the relative effectiveness of observational learning and reinforcement techniques could be assessed.

To achieve these objectives, a training model was designed which had a three-phase format: (i) A presentation phase involving observation of a teacher modelling a single teaching skill; (ii) a practice phase during which subjects attempted to imitate the behaviour of the teacher model; and (iii) a feedback phase during which subjects were provided with knowledge of results in the form of positive reinforcement for appropriate imitative efforts.

In creating the microteaching procedures, teacher educators at Stanford incorporated this format in the Teach/Critique/Reteach Cycle noted above. At the same time, staff concern with developing training

programmes for student teachers meant that interest waned in using the format purely as a research paradigm for the comparison of modelling and reinforcement techniques (McDonald, 1973). There were also shifts of emphasis within the format itself. For example, the original reason for reducing the teaching time in microteaching was a practical one: five-minute sessions interspersed with feedback and modelling provided "a practicable number of learning trials for behavior modification experiments" (McDonald, 1973: p.2). In the hands of teacher educators, however, emphasis was placed on reducing the complexity of the classroom situation to afford student teachers a 'safe' environment in which to practice a single teaching skill (Allen and Ryan, 1969). Certain flexibilities were also introduced into the modelling and feedback components of the microteaching cycle that would not have been permissible under the controlled conditions of a behaviour modification experiment.

Despite these variations, the Stanford model of microteaching represented a fairly systematic application of behavioural control psychology. As such, the acquisition of teaching skills through a modelling/practice/feedback sequence was based on three well-established principles in behaviouristic learning theory:

1. The learning of a complex behaviour is more effective if the behaviour is divided into its component parts and learned step-by-step before it is undertaken as a whole.

2. Observational learning through a model is an effective means of acquiring operant behaviours.

3. The learning of operant behaviours is strengthened by their reinforced practice.

Some idea of the significance of these principles in microteaching which follows the Stanford model may be gained by examining two of its overriding features: (i) the component skills approach, and (ii) the use of modelling and reinforcement procedures.

The Component Skills Approach

The Stanford model of microteaching is a training system built around competency in specific teaching skills, e.g., stimulus variation, set induction, closure, reinforcement, fluency in

questioning, high order questioning, planned repetition (Allen and Ryan, 1969: p.15). Borg has summarised the advantages of the approach:

> "First it is much easier for the teacher to incorporate a behaviorally defined technical skill into his classroom behavior than a vaguely stated exhortation .... Second, using behaviorally defined skills makes it much easier to derive objective, reliable measures of changes in teaching behavior. Finally, by working with technical skills, researchers can conduct more meaningful investigations of the relationship between teacher performance and pupil learning."
>
> (Borg, 1970: p.36.)

This orientation for microteaching rests upon two assumptions. The first is that teaching can in fact be analysed into specific and relatively discrete behavioural components (the technical skills of teaching) without violating the essential nature of the teaching act. A second is that effective teaching behaviour can indeed be learned on a skill-by-skill basis; that is to say, a student teacher will be able to synthesise his repertoire of separately acquired skills into the totality of his teaching behaviour in the classroom.

In these two assumptions the influence of the behaviourist's analysis of the learning process is clearly evident: the division of complex behaviour into simpler elements, the learning and perfection of these elements separately, and subsequent combination of the learned elements to perform the complex behaviour. Thus, in microteaching programmes that follow the Stanford model, participants build up a repertoire of individual skills which are meant to be integrated with each other in different ways when facing the more complex demands of various kinds of teaching situation in the real classroom.

Modelling and Reinforcement

The use of modelling in microteaching at Stanford was suggested by research findings on the rôle of observational learning in personality development. A review of the relevant literature by Bandura and Walters (1963) has shown that complex social behaviour may be acquired almost entirely through imitation. Moreover, Bandura, Ross and Ross (1961) have shown that film-mediated models are as effective as real-life models in transmitting particular behavioural patterns to observers.

While most research on modelling and imitation learning has

concerned children's social behaviour, early experiments at Stanford with microteaching confirmed that adult observers could readily imitate teaching skills that were modelled by teachers in videotape presentations (Orme, McDonald and Allen, 1966). In this regard, the Stanford approach to microteaching appears to have attempted an integration of observational learning theory with operant conditioning or reinforcement theory. Several aspects of this integration may be highlighted:

1. Modelling and Shaping Procedures. McDonald (1973) has described the theoretical standpoint that was taken in formulating the Stanford model of microteaching. The general principle adopted was that observation of a model by a learner is sufficient for acquiring a behaviour, even if this behaviour is not reinforced during the acquisition stage. However, the necessary conditions were that the model's behaviour had to be reinforced by its consequences, and that any behaviour acquired by an observer had to be reinforced for it to maintain its strength. Consequently, in the Stanford approach to microteaching the student-teacher observes and attempts to approximate the teaching behaviour of a model who has received reinforcement for his use of a particular skill (for example, through pupil responsiveness). Further to this, a supervisor uses a videotape replay of the microteaching performance to "shape up" the student-teacher's behaviour by positively reinforcing only what he considers to be desirable instances of the skill and ignoring undesirable instances of its use in the hope of extinguishing them. This kind of feedback relates to the behaviouristic theory of acquiring new patterns of behaviour through successive approximations. It is hoped that the student-teacher will modify his application of the teaching skill by coming closer to the ideal represented by the model when reteaching his lesson with a different group of pupils, as well as during his subsequent classroom practice.

2. Cueing. Some research has shown that there is more likelihood of observer attention to relevant stimuli when modelled behaviours are made more distinctive by cueing procedures (Sheffield and Maccoby, 1961; Wulff and Kraelig, 1961). Hence videotape models in the Stanford approach to microteaching are usually accompanied by salient cues or prompts in order to point up the behaviours to which the desired teaching skill should be attached (c.f., Orme, 1966; Borg *et al.*, 1968; Claus, 1969; Young, 1968). In addition, research in

programmed learning has indicated that cueing increases the effectiveness of confirmation feedback and may even be more effective than this form of feedback (Angell and Lumsdaine, 1961). According to Orme (1966), the findings of these research studies suggested the particular combination in Stanford microteaching programmes of reinforcement and cue discrimination training during video replays of a microteacher's performance (c.f., also McDonald and Allen, 1967).

3. Types of Models. The predominant use of visual-perceptual (videotape) models in Stanford microteaching offers opportunities for cueing that are not possible with a symbolic model, i.e., with a written description of a teaching skill, together with some written examples of its use. If symbolic modelling alone were used, a supervisor would have to rely much more on shaping and cueing procedures during the feedback phase of microteaching in order to train teaching skills. McDonald and Allen (1967) have used Sheffield's (1961) concept of "perceptual blue-printing" to explain the efficacy of videotape models. According to Sheffield, this "blue-print" is akin to Tolman's (1959) "cognitive map" in that both function as organisers of stimulus-response units. Thus the "perceptual blue-print" is said to account for how a teacher trainee is able to transfer a whole class of teaching behaviour (e.g., high order questioning) from its use in specific stimulus-response sequences of one modelling situation to the different stimulus events of his own teaching. In other words, it is claimed that training through modelling is not restricted to specific stimulus-response sequences and reliance on simple stimulus generalisation (Orme, McDonald and Allen, 1966).

Problems in the Behaviouristic Approach

Despite the popularity of the Stanford approach to microteaching, there has been growing doubt about the validity of its theoretical assumption that the separate practice of the behavioural sub-components or technical skills of teaching is the most effective way of learning to teach (see, for example, Siedman, 1969; P.M. Allen *et al.*, 1970; Guelcher *et al.*, 1970; Nash and Agne, 1971; Beattie and Teather, 1972; Combs, 1972; Snow, 1972; Weiss, 1972; Foster *et al.*, 1973; Joyce and Weil, 1973; Freyberg and Katterns, 1971; Freyberg *et al.*, 1974). The Stanford model of microteaching may be questioned on at least two

major counts:

(i) The effectiveness of the specific skills taught in promoting pupil learning, and

(ii) the relationship between the separate practice of single skills and teaching as a complex decision-making process.

Effectiveness of the Specific Skills

Teaching skills in the early microteaching programmes at Stanford were not selected in accordance with some conception of effective teaching, but were simply those skills which the microteaching staff deemed "would be of most use to beginners" and which "could be trained for in the clinic" (Allen and Ryan, 1969: p.14). As a result of evaluating these programmes, however, Cooper (1967) expressed the hope that every institution adopting the microteaching procedure would also set up research to test the effectiveness of the skills being emphasised in actually promoting school learning. This was echoed by Borg (1970) who, as mentioned earlier in this chapter, saw the component skills approach to microteaching as a convenient means of researching the relationship between teaching performance and pupil learning.

In practice, very little research of the type suggested by Cooper and Borg has eventuated (Cooper and Allen, 1970). Yet an assumption appears to have been built up in many microteaching programmes that the original Stanford skills are indeed those which are most basic to effective teaching. There is no research evidence to support this view, except perhaps for some correlations which have been established in studies outside the microteaching setting between a few of the skills and pupil achievement. These studies have been reviewed by Rosenshine (1971) whose interpretation of their results, however, has not gone unchallenged (see, for example, Gall, 1973; Heath and Nielson, 1973).

The lack of research evidence concerning effectiveness of the Stanford skills is not surprising, for this type of research rests upon the questionable assumption that the teaching act is a conglomerate of separately effective skills. Examining this problem in relation to microteaching and other forms of competency-based

teacher education, Joyce has observed that "the teacher is being conceived almost as a swordsman who lays about the learner with his repertory of sharp-pointed skills, each of which will have a mechanical effect on learning outcomes" (Joyce, n.d.: p.3).

In Joyce's view, such is not the nature of the teaching-learning process. Consonant with Dewey's (1937) notion that learning is the product of the interaction of the learner with an environment, Joyce has postulated that it is the learner's own activity which results in learning and that the teacher becomes important as he helps create, contributes to, and becomes part of the environment with which the learner interacts. From this point of view, teaching skill is the creation of learning environments (Joyce, n.d.; Joyce and Weil, 1972, 1973).

Unfortunately, educational research has been unable to identify any single, multi-purpose way of arranging a single learning environment (or teaching strategy) which is superior to all others and which all teachers should therefore adopt. As a result, Joyce and Weil (1972, 1973) have suggested that teachers should be helped to develop competency in a variety of instructional rôles which create learning environments appropriate to differing kinds of learning goals. In effect, this means mastery of the theory and practice of a wide repertoire of rôle-appropriate models or strategies of teaching so that "flexibility in teaching and decision-making is increased" (Joyce and Weil, 1973: p.47). Teaching models in the teacher education programme developed by Joyce and Weil (1973) have been deliberately selected to represent different frames of reference towards the nature of man, the way he learns, and what he should learn. Hence, student teachers have opportunities to explore a variety of philosophical and psychological standpoints concerning teacher rôle in the creation of learning environment: the progressivistic tradition is embodied in a range of social interaction models in which the teacher plays the rôle of community builder; various discovery, discussion and expository teaching models put the teacher in the rôles of academician and skill builder helping pupils to process substantive ideas; humanistically-oriented models enable the teacher to help pupils devise their own learning activities and to express themselves creatively; and operant conditioning approaches to teaching relate to the teacher's rôle as a community builder and skill builder.

The conception of teaching as the creation of learning environments has important implications for the effectiveness of specific teaching skills. In the first place, the amount of learning which takes place is more likely to be related to the overall impact of the learning situation rather than to teacher use of any one type of teaching skill (Joyce, n.d.: p.3). To illustrate: in a small group discussion environment, the contribution of a teacher's high order questions to pupil achievement is more likely to stem from the interrelationships of these questions with numerous other variables in the context of the total learning environment, than it is from the use of these questions *per se*. Thus a teacher who uses high order questions more than other teachers probably also does many other things as well (Joyce, n.d.).

Secondly, it must be recognised that some teaching skills are not relevant to all teacher rôles (or models of teaching) and that, even where they are relevant, it is unlikely that any single type of skill, or combination of types, will be equally effective in all of these rôles. Some pilot research by Weil (1973), for example, has suggested that the effectiveness of some types of skills may be specific to the particular teaching model.

Thirdly, because it is the pupil's own activity that results in learning, his particular abilities, intelligence level, experiential background and self-concept will be significant determinants of the learning he achieves from interaction with a given learning environment. Clearly, therefore, no one type of teaching model, let alone any one type of teaching skill, could be expected to have the same effect on all pupils.

The quest for a set of generally effective teaching skills -- those which have a powerful impact on pupil learning across all types of teaching approach -- has been summarised by Joyce as follows:

> "Teaching ... is a multidimensional act that fits in a multidimensional context to produce multidimensional environments which are interacted with by multidimensional learners. Given this condition, research on teaching effectiveness will produce a multivariate kind of truth. We will not end up with formulas that we can state in unequivocal, mechanical terms such as 'teaching skill such-and-such when present increases such-and-such a kind of learning in such-and-such a way'. A teaching skill will be more likely a small but useful part of a certain kind of environment which will be reacted to differentially by

learners and will have a number of kinds of main and side effects."

(Joyce, n.d.: p.4.)

This analysis casts serious doubt on the viability of micro-teaching which emphasises the practice of separate skills -- whether or not a claim is made that those skills are most basic to effective teaching. Discussion in the next section takes this point further by examining the likely effects of skill-by-skill training on student ability to handle teaching behaviour in a sensitive and flexible manner.

Microteaching and Teaching as Decision-making

The highly directed and controlled nature of the Stanford approach to microteaching is said to be its special strength. Modelling ensures that student teachers know precisely what their performance goals are, while practice and feedback conditions are engineered so as to maximise the likelihood of those goals being achieved. The question arises, however, as to whether the prediction and control of student teacher performance in relatively discrete skills is an appropriate foundation for developing independence and flexibility as a professional decision-maker, and a personal teaching style.

Teaching is an exceedingly complex activity, the general nature of which varies according to the sources for learning goals and experiences. When curriculum is prescribed by the teacher, teaching usually proceeds on the basis of an overall strategy related to one or a combination of teaching modes -- what Joyce and Weil (1972) have called models of teaching (see above). A teaching strategy is a generalised plan for one or more lessons which includes desired learner behaviour in terms of the goals of instruction, and an interrelated sequence of teaching tactics or sub-strategies to implement the strategy (Strasser, 1967). Thus the teaching strategy for a mathematics lesson might involve a combination of the guided discovery and expository teaching modes, with the planned tactics consisting of a particular sequence pattern for the presentation of learning tasks and activities, manipulative materials, teacher questions and explanatory information.

When pupils are being encouraged to develop their own learning goals (e.g., in developmental and humanistic approaches to teaching),

teaching strategies and tactics are more likely to be non-directive in nature: primarily, the teacher's rôle is to help pupils to negotiate their personal learning goals, and to make himself, other persons, materials, time and space available as resources in order that those goals can be achieved (c.f., Combs, 1965; Rogers, 1969; Joyce and Weil, 1972; Greene, 1973). Nevertheless, "teachable moment" apportunities within this kind of learning environment may be taken up by the teacher whereupon the strategy and tactics tend to be of the instructional type, albeit often planned on an "on-the-spot" basis.

Interactive teaching, of course, seldom consists of just applying the tactics of a planned strategy in an arbitrary fashion. The competent teacher usually plans for teaching, mindful that the complex interactions of his own behaviour with pupil, task and situational variables will generate a multiplicity of cues, his "reading" of which will tend to determine whether he sustains planned teaching goals and tactical behaviour, modifies this behaviour, or sets up alternative goals and implements other teaching approaches. Typically, then, a teaching strategy evolves as the combined implementation of planned and responsive tactics (Strasser, 1967). The latter are adjustments to originally intended teaching behaviour and are of two types: (i) Those which bring about change in the planned pattern for an overall teaching strategy, i.e., they alter the order for planned groups of tactical behaviours, and (ii) those which alter the planned sequence or nature of the specific teaching behaviours within any one group of tactical moves. This flexibility in teaching behaviour is the heart of interactive teaching. Sensitive and flexible control of planned and responsive tactics will depend upon a teacher's ability to distinguish, interpret and diagnose significant cues in the teaching environment, and upon his possession of a wide behavioural repertoire from which to draw appropriate skills (Strasser, 1967).

It is difficult to see how any component skills approach to microteaching could sensitise student teachers to the many interactions of teacher, pupil, task and setting variables in teaching -- the operational "mix" -- and thus help them begin to learn how to "read" the cues that might signal the need to adjust teaching behaviour and/or goals. Indeed, divorcing the practice of a skill from its relationships with other skills in the context of the total teaching act may actually make the task of learning how to teach unnecessarily difficult

(c.f., Siedman, 1969; Beattie and Teather, 1972).

First, the concentrated practice of one skill at a time in microteaching would tend to focus student teacher attention on a narrow range of cues only, e.g., related to the skill of reinforcement, focusing mainly on correct and incorrect pupil responses. Consequently, alertness to numerous other cues in the teaching environment would be less likely with the probability, therefore, that a variety of situations requiring adjustment to planned teaching behaviour would be overlooked. The general effect of this would be to limit student teachers' experience in testing their ability to select the most appropriate skill, or tactical sequence of skills, related to changing circumstances in a teaching situation.

Secondly, there is the problem of artificiality for practice teaching. Although microlessons are meant to involve student teachers in real teaching (Allen and Ryan, 1969), the emphasis in these lessons on a single skill would tend to overshadow student effort to use that skill in association with others for genuine pedagogical purposes. The likelihood of this occurring would be greater when the criterion of successful performance of a skill is increasing the frequency with which it is used: a skill would tend to be artificially "forced" rather than being employed on appropriate occasions within the context of an overall teaching strategy or a particular tactical sequence. In short, a component skills orientation for microteaching is likely to encourage the practice of a skill for the sake of practising a skill (Guelcher *et al.*, 1970; Clift *et al.*, 1974).

Eventually, of course, this rather artificial situation gives way to classroom practice in which separately trained skills must be integrated for particular pedagogical purposes. Thus, in their account of the Stanford microteaching procedure, Allen and Ryan have stated: "When the teacher has control over several teaching skills and knows what the effects of each are, the next step is to apply these skills to achieve his instructional aims. For this teacher the teaching act involves decisions about when and where to apply his skills" (Allen and Ryan, 1969: pp.23-24). But this statement appears to contradict Allen and Ryan's claim that microteaching is real teaching. It seems that in learning how to teach, one must first of all separate teaching skills and their possible interrelationships from instructional aims, and only later attempt to integrate the two. In other words, the

student teacher is required to attain proficiency in separate components of the teaching act largely devoid of genuine pedagogical intent and, subsequently, to put the teaching act together again as it is really meant to be.

The teaching act is more than the sum of particular technical skills. Teaching has a holistic quality that results from the complex interrelationship of teacher and pupil behaviours as these are directed towards certain learning goals. A behaviouristic orientation for microteaching underestimates and overrides the student teacher's cognitive disposition to perceive and handle the teaching process in this way. In particular, by denying him opportunities to plan, implement and evaluate teaching strategy and tactics on an independent basis, microteaching may well impede rather than release his potential as a teacher.

Thus, it can be argued that the highly controlled and analytic nature of microteaching results merely in a more limited type of apprenticeship training than that provided by conventional school practice. Despite its emphasis on observational learning and practice, the school experience does at least preserve the holistic nature of the teaching act, asks the student teacher to assume a variety of teacher rôles, and does not entirely rule out opportunity for personal explorations into the teaching process. In contrast, McIntyre has said of microteaching: "It would be difficult to find a method of teaching in which less emphasis is placed on the student's formulation of his own problems, questions and objectives" (McIntyre, n.d.). In microteaching, not only must students concentrate on the imitative practice of one skill at a time, but the particular set of skills being emphasised (e.g., reinforcement, set induction, stimulus variation, questioning fluency) emphasises a restrictive view of the teacher simply as a controller and director of the class, rather than as a promoter of a variety of child-centred, developmental or humanistic approaches to learning (Siedman, 1969).

Furthermore, this traditional emphasis is parallelled by the assumption underlying microteaching that it is the <u>teacher educator's</u> rôle to control the behaviour of the <u>student teacher</u>. Thus, in both its teaching method and the skills it emphasises, microteaching tends to be in conflict with the wider variety of teaching approaches which many teacher educators would most encourage their students to use.

As such, microteaching may narrow the student teacher's opportunities for professional decision-making, at the same time disposing him towards assuming a limited type of teacher rôle with his future pupils.

Microteaching: A Sensitisation Model

Discussion in the preceding section has attempted to highlight several propositions concerning the nature of teaching. The first proposition is that, in the absence of research evidence indicating superiority for one teaching approach over all others, teaching skill is best conceived as the ability to create a variety of learning environments using teaching strategies that are appropriate for particular kinds of learning outcomes.

A second proposition arising out of the first is that a teaching strategy may consist of one or a combination of teaching modes, and usually evolves during interactive teaching as a series of planned and/or responsive tactics.

The third proposition is that the teaching-learning process has a holistic, organic property stemming from the highly integrative nature of interaction amongst teacher, pupil, task and situational variables. As such, no hierarchy of importance in terms of effectiveness can be assumed for particular teaching skills: any teaching skill can be appropriate, on occasion, depending upon the function and teaching objective it is intended to serve within the framework of a tactical sequence. Moreover, the contribution of a given class of skills to pupil achievement does not stem from use of these skills *per se*, but more likely from their interrelationships with all other skills and variables in the context of the total teaching act.

On the basis of these propositions, it can be argued that the competent teacher is one who:

(i) is able to draw upon a wide REPERTOIRE of teaching modes and their associated skills in order to plan and implement a variety of learning environments that are appropriate for differing kinds of learning outcomes;

(ii) is SENSITIVE to cues in the teaching-learning situation which signal that it is appropriate either to sustain or to modify planned teaching goals and patterns of

behaviour; and

(iii) is able to flexibly CONTROL a repertoire of strategies and tactical skills in the sense that, either as originally planned or responsive moves, they are suitably matched to his intentions regarding pupil behaviour and learning.

Thus the competent teacher is an informed and flexible decision-maker. He may be conceived as being somewhat like the professional golfer who not only commands a wide repertoire of games strategies and clubs, but chooses appropriate tactics (particular clubs and particular shots with those clubs) according to his keen perception of conditions in the golfing environment. It must be recognised, of course, that handling a behavioural repertoire is a much simpler matter in golfing than is the case with teaching: there is a vast difference between controlling one's behaviour in relation to an inanimate and standardised ball, and in exercising the sensitive control which is required to guide psychologically diverse, ever-changing, and often unpredictable pupils in certain educational directions.

The notion of competent teaching as sensitive control of teaching repertoire suggests a different type of microteaching experience from that provided by the classical Stanford model. Microteaching may contribute best to the initial preparation of student teachers as professional decision-makers when it focuses on exploring and evaluating the appropriateness of alternative patterns of teaching strategy and tactical behaviour related to a wide variety of teaching modes. Thus, depending upon the complexity of the situation they are presented with, microteachers might explore their full repertoire of teaching skills, focus on a particular cluster of interrelated skills, or explore a particular teaching mode in phases extending over several microlessons. Eventually, microteaching practice could incorporate combinations of teaching modes in a series of microlessons making up a small-scale curriculum unit.

From this point of view, microteaching would involve student teachers in real teaching in miniature. Teaching strategy and tactics would have genuine pedagogical purpose, while attention would be directed to specific teaching skills only as these happened to be required within a tactical framework. The professional learning objectives would be both behavioural and attitudinal: sensitive and

flexible control of the teaching repertoire in a range of teaching modes, the valuing of this ability as a feature of competent teaching, and an increased sensitivity to oneself, to one's pupils, and to classroom interrelationships (c.f., Siedman, 1969). Not only does this approach seem to be more theoretically sound than the Stanford model, but it might well increase the likelihood of positive transfer of teaching behaviour from the microteaching laboratory to the classroom situation.

A schematic representation of this proposal for microteaching is shown in FIGURE 2.1 (p. 218). At the centre of the model, the intersecting circles illustrate interactions of repertoire knowledge, repertoire control, and sensitivity to cues in the teaching-learning environment as these three professional attributes relate to any one, or a combination of, teaching modes, e.g., teacher-led discussion, the laboratory method, exposition, inquiry-discovery, recitation and drill, and so on. As the model shows, exploration of these interactions would eventuate first of all within the 'safe' setting of the pre-service microteaching laboratory, extend to periods of student teaching in schools and lead, hopefully, to ever-increasing sensitive control of teaching behaviour as experience accumulated in many classrooms with a variety of pupils and teaching situations.

The intersection in the model of the circles labelled repertoire knowledge and cue sensitivity indicates the importance of developing an awareness that certain cues in the teaching environment relate to possibly-appropriate teaching behaviours, e.g., pupil anxiety cues which may well signal that some prompting, re-explanation, use of concrete illustrations, review of previous steps, and so on, are necessary.

The intersection of the repertoire knowledge and repertoire control circles suggests that knowledge about teaching behaviours or skills needs to be matched with the ability to control these: that is, for the teacher to be able to act so as to elicit the pupil behaviour and learning he intends. For example, he must not only know about various types of cognitive questions, but be able actually to frame an appropriate evaluation question about a substantive idea at the right moment.

The intersection of the circles for cue sensitivity and repertoire control suggests that the ability to select the appropriate teaching

repertoire in accordance with environmental cues must also be a focus. For instance, students need to learn how to successfully adjust their teaching when a planned inductive teaching strategy appears to be leading to pupil confusion, as revealed by incomplete answers, inability to form generalisations, unwillingness to respond, facial expressions, and so on.

Finally, the intersection of all three circles in the model suggests an overall objective for microteaching -- and for subsequent classroom teaching -- namely, the sensitive and flexible control of teaching repertoire which has been discussed above.

This model reflects what Joyce and Weil (1972, 1973) have termed a pluralistic or repertory approach to teacher education. Student teachers would be encouraged to develop not only a wide repertoire of teaching modes related to various philosophical and psychological standpoints, but also the ability to implement the basic action sequence for any mode in a variety of ways. As a result, they would acquire, hopefully, a rich store of potential strategies which they could bring to bear on specific kinds of learning problems.

From this perspective, microteaching laboratories related to a given teaching mode might well take the form of:

1. Study and analysis sessions

   - To develop awareness of the value-base, basic action sequence and repertoire potentially available in the mode.
   - To analyse teaching samples with an appropriate interaction analysis instrument in order to discriminate relationships between environmental cues and teaching behaviours, as well as to discuss teaching strategy and tactical sequences.
   - To theorise about alternative ways in which the mode might be implemented.

2. Microteaching sessions

   - To try alternative ways of handling the mode and thus increase sensitivity to cues in different interactive situations.
   - To develop sensitive control of teaching behaviour.

3. Feedback sessions

   - To analyse microteaching performance with an appropriate interaction analysis instrument in order to compare teaching intentions with teaching actions.

- To encourage self-evaluation.
- To theorise about the teaching process.
- To propose further teaching approaches to try.

The concern of the model of microteaching just proposed is not with imitative practice of the one 'right' way to implement teaching strategy and tactical behaviours, since there is no evidence from educational research that might justify such an approach. Just as teaching is a process of learning and inquiry, so too the basic values underlying the sensitisation model of microteaching are the student teacher's self-inquiry into his own teaching behaviour and self-directed change in his interactive teaching patterns (c.f., Flanders, 1970; Morine, 1974; Flanders, 1976). At the same time, the model provides opportunities for the student teacher to relate his own uniqueness as a person to his professional behaviour -- to give this behaviour personal fit (c.f., Combs, 1965; Siedman, 1969). Thus microteaching on this pattern would encourage the student teacher to set up his own inquiry projects into teaching and become his own "researcher" on what is likely to be appropriate teacher behaviour for particular situations (c.f., Stenhouse, 1975). In McClosky's terms (1971), the student teacher would come to regard himself as a teacher who is learning, rather than as a learner who is "practising" teaching.

This self-learning orientation presupposes a different supervisory ethos from that of the Stanford model of microteaching. The rôle of the microteaching supervisor is not to reinforce what he believes to be effective teaching behaviour -- to train, control and mould. Instead of judging microteaching performance, the supervisor's task is to encourage student teachers to investigate their own practice and to make their own estimates of the suitability of particular teaching patterns. Essentially, then, the rôle suggested for the microteaching supervisor is a non-directive and facilitative one (c.f., Combs, 1965, 1972). The valuing process in microteaching, as well as decisions to change teaching style or to explore alternative teaching approaches, are in the hands of the individual student.

Although microteaching continues to be used in most teacher education programmes mainly as a training procedure in the component skills of teaching, the wider and more integrative objectives suggested by the sensitisation model above are not without precedent. Reference has already been made, for example, to Joyce and Weil's (1973)

teacher education programme in which microteaching helps student teachers acquire the necessary repertory to manifest a range of models of teaching suited to differing teaching purposes. Again, P.M. Allen *et al.* (1970), Emmer and Millett (1970) and T.B. Gregory (1972) have all favoured the microteaching situation being used for the analysis and practice of a variety of teaching strategies, while Guelcher *et al.* (1970) at the University of Chicago have extended this same focus to experience in teaching a series of microlessons which make up what might be termed a mini-curriculum unit. Furthermore, there are signs more lately that Stanford microteaching programmes have, in practice if not in theory, been moving away from their behaviouristically dominated orientation of the 1960s towards the more holistic approach suggested by a sensitisation model (see, for example, Snow, 1972; Weiss, 1972; Freyberg, personal communication, 1977).

The microteaching experience provided within the framework of the present study was strongly along the sensitisation lines described in this section. In the next chapter, a review of the microteaching literature will not only attempt to assess the effectiveness of the Stanford model and of various components in the microteaching format, but will also examine research studies which seem to lend support to the sensitisation approach.

CHAPTER 3

REVIEW OF RESEARCH RELEVANT TO THE STUDY

OUTLINE: The general effectiveness of microteaching programmes adopting the Stanford behaviouristic model is analysed, together with findings from research which has explored the viability of alternative approaches. Consideration is then given to the research findings on variables operating within the presentation, practice and feedback phases of the microteaching format. A summary and comment section for each section in the chapter indicates the strengths, gaps and weaknesses in past research, which provided guidelines for the development of the microteaching programme in the present study.

Apart from theoretical ideas and the few developmental programmes mentioned in the previous chapter, the view of microteaching as a sensitisation experience has received little attention from researchers. Almost all of the research on microteaching adopts some form of the original behaviouristic model developed in the teacher education programme at Stanford University. This chapter reviews the research on Stanford-type microteaching programmes, together with the few alternatives devised, in an attempt to isolate factors which might contribute to the success (if any) of the microteaching procedure. The review is organised in sections as follows:

An evaluation of the research evidence on the general effectiveness of microteaching.

A review of the research on components within the microteaching format with particular reference to the concerns of the present study:

a. The presentation phase.

b. The practice phase.

c. The feedback phase.

Conclusions.

The General Effectiveness of Microteaching

In the teacher education programme at Stanford University, microteaching was originally conceived as a preliminary and complementary experience, rather than as an alternative, to conventional practice teaching in schools. It is somewhat surprising to find, therefore, that a number of studies have made a direct comparison of the effectiveness of these two kinds of practice teaching provision. Nevertheless, two other trends are evident in the research literature. First, a series of studies has focused on the effectiveness of the self-contained microteaching programme for changing the behaviour of pre-service and in-service teachers. Secondly, other studies have examined the relative effects of microteaching and regular coursework in preparing student teachers for school practice.

The review of literature to follow considers the general effectiveness of microteaching under these headings:

Self-contained microteaching programmes.
Microteaching and conventional practice teaching.
Microteaching and regular coursework.
Attitudes towards microteaching.
Is practice necessary?

Self-contained Microteaching Programmes

The earliest evaluations of microteaching under experimental conditions were conducted in the summer school clinics at Stanford University beginning in 1963. In the first of these clinics (Clark and Allen, 1967), sixty secondary school teacher trainees were randomly divided into two groups, one of which was assigned to an 8-week microteaching experience and the other to an observation and teacher-aide programme in schools (the control group). As judged by supervisor and pupil ratings on the first version of the Stanford Teacher Competence Appraisal Guide (STCAG), the microteaching group with a commitment of less than ten hours weekly obtained significantly higher ratings for teaching competence than did the control group which devoted 20-25 hours weekly to work in schools. Not only were there considerable time savings in using the microteaching procedure, but it was found that performance in microteaching significantly

predicted grades during a subsequent internship in schools.

The 1965 and 1966 clinics at Stanford did not compare micro-teaching with conventional practice teaching, but evaluated teacher competence in terms of changes made in performance as a result of microteaching experience alone (Cooper and Stroud, 1966; Fortune *et al.*, 1967). Both clinics involved teach and reteach cycles in a micro-teaching setting, subsequent to which trainees worked in small supervised teams to prepare and teach a unit of twelve 20-25 minute lessons, each lesson being followed by a supervisory conference of about the same duration.

In the 1965 clinic, the STCAG instrument included specific teaching skills under broad categories of teacher behaviour, each category being rated on a 7-point scale. An analysis of pre- to post-test performance showed that significant mean score gains were achieved over the whole programme in nine out of the twelve behaviours that had been determined as objectives for the clinic.

The skills focus was far more specific in the 1966 clinic with each microteaching cycle emphasising a single teaching skill, e.g., reinforcement, high order questioning, lecturing, set induction, presentation and closure procedures. The STCAG was redesigned to facilitate the rating of teaching performance on each skill and, though not validated prior to use, the separate rating scales were later shown to have reasonable validity and reliability. Significant mean score gains were evident for pre- to post-test performance, but pupil ratings indicated greater gains for microteachers than did estimates provided by supervisors. Reasons for this discrepancy were not given by the programme directors (see Cooper and Stroud, 1966).

Clift *et al.* (1974) in Melbourne studied the relative effects on student teachers' questioning and demonstration skills in the task of set induction of using four or six teach/reteach cycles, each combined with supervisor feedback alone, supervisor and video feedback, or supervisor and audio feedback. In addition, these investigators made a cost analysis of the microteaching procedure. Although micro-teachers demonstrated significant improvement in teaching performance between the first and final sessions in the programme, further analysis revealed that a number of students did not improve, while the performance of some actually deteriorated. The investigators suggested several possible reasons for the lack of impact in the case

of a number of students: negative reaction to the microteaching procedure, in particular the possibility that there was conflict between natural teaching style and the skills being emphasised; the supervisory style used in the study; or negative effects of the video self-confrontation experience. The addition of a video replay to the supervisory conference in this study did not significantly improve teaching performance. Furthermore, the effect of audio feedback varied according to the level of competence at entry to the programme: students with a low entry score improved their performance, but this mode had a negative effect on student teacher performance when entry score was high. While acknowledging the general effectiveness of microteaching, Clift *et al.* expressed doubts about its usability considering the high cost involved in terms of video equipment, time and the number of supervisory personnel required for its efficient operation.

The most comprehensive application of the Stanford approach to microteaching is undoubtedly represented by the minicourses developed as in-service training programmes at the Far West Laboratory for Educational Research and Development. The minicourses differ from the Stanford format, however, in that each is a self-instructional package focusing on clusters of related skills arranged in sequence, or on a particular teaching strategy. A course package includes instructional and model films, teaching handbooks, self-rating forms, and detailed guidelines on how to change teaching behaviour without recourse to the advice of an 'expert' supervisor. It has been standard procedure to field-test each minicourse prior to its publication and, whenever possible, to test for both immediate and long-term effects of the course experience. By and large, these tests have revealed substantial pre- to post-test gains in teacher performance of the specific skills of the programme and it has been claimed (Borg *et al.*, 1968, 1969; Acheson and Zigler, 1971; Borg, 1970, 1972; Perrott *et al.*, 1975, 1976) that the minicourse is thus an effective means of teacher training.

Microteaching and Conventional Practice Teaching

Of the research which makes a direct comparison between the effects of microteaching and conventional school practice, a study by Kallenbach and Gall (1969) is particularly important because it

represents a partial replication of an earlier control study conducted at Stanford by Allen and Fortune (1966). All 37 elementary school interns in a 10-week summer school programme received common course-work in professional studies, but were randomly assigned as two groups to either a microteaching treatment or a conventional school practice programme. On average, microteachers had 20-25 hours of microteaching activity, including detailed feedback on teaching performance based on a modified version of the Stanford Teacher Competence Appraisal Guide (STCAG). Students assigned to the control group worked, on average, for 120-125 hours in the school setting and received limited and occasional feedback only.

All students taught microlessons prior to and after treatment which were assessed by means of an averaged rating on 17 dimensions of the STCAG. This instrument and the Observation of Teaching Activities Scale (IOTA) were then used to assess teaching performance early in the intern year, with the IOTA alone being used for a final post-test later in that same year. Contrary to Allen and Fortune's (1966) finding, analysis of covariance and t test procedures revealed that the two experimental groups did not differ significantly from each other, either in the microlesson post-test or in subsequent classroom teaching. Nevertheless, Kallenbach and Gall concluded that micro-teaching was superior as a training method when compared with conventional school practice since it achieved similar results in only one-fifth the time. In addition, the fact that microteaching significantly predicted subsequent classroom performance indicated that "while microteaching scales down the classroom situation, it does not distort it" (Kallenbach and Gall, 1969: p.141).

Results in this study, however, need to be treated with caution. First, no details are reported by Kallenbach and Gall on the content of the microteaching and school practice treatments. Unlike the earlier Stanford study by Allen and Fortune (1966), for example, it does not appear that emphasis was placed on a prior set of skills. Secondly, several potentially relevant influences on student teacher performance do not appear to have been under experimental control (e.g., learning objectives, time allocations, and the amount and kind of supervisory feedback). One might entertain the possibility, therefore, that in this study the lack of difference between the two treatments was due to the relatively small time allocation given to

microteaching. Thirdly, as the investigators themselves have recognised, the study did not exactly replicate Allen and Fortune's (1966) research because (i) the subjects were a highly selected group; (ii) the results refer to elementary rather than secondary teacher trainees; (iii) there may have been unwitting departures from the Stanford microteaching model; and (iv) different measuring instruments were used in different ways.

Nevertheless, other studies have shown microteaching to be superior to conventional practice teaching. With reference to a range of science teaching techniques, Harris *et al.* (1970) found that prospective science teachers who microtaught peers six times over a semester were superior to another group which taught a large group once only. But this study exhibits the same confounding of variables mentioned with reference to Kallenbach and Gall's research. It is difficult to tell from the results whether the difference between the two groups was due to the number of microteaching sessions or to the microteaching treatment *per se*.

In a preliminary report on a well-controlled study, however, Levis *et al.* (1973) indicated that secondary teacher trainees in a microteaching programme were significantly superior in their use of high order and probing questions to another group which had undertaken conventional school practice. There was no significant difference between the two groups in questioning fluency. In addition, Legge and Asper (1972) found that elementary school teacher trainees who participated in a 14-week microteaching programme were significantly better at evaluating the aims, planning and presentation of a sample lesson than trainees who experienced conventional practice teaching. Of special interest in this study was the finding that the microteaching group reached a level of competence in evaluation similar to that of experienced supervisors who also rated the criterion lesson.

Microteaching and Regular Coursework

Some researchers have investigated the effects on subsequent performance during school practice of microteaching in combination with professional studies coursework versus coursework only. Young and Young (1969) assigned student teachers to these two treatments and analysed videotaped samples of their teaching half-way through and towards the end of a school practice period. The analysis showed

that student teachers in the microteaching plus coursework treatment acquired a significantly greater number of specific teaching skills and exhibited greater flexibility in using alternative teaching patterns than did those student teachers in the coursework only treatment.

In a study by Jensen and Young (1972), the longitudinal effects of microteaching were assessed using a repeated measures and control group research design. Prior to an 8-week practice teaching experience in schools, 37 secondary teacher trainees were randomly assigned to an experimental or control group. Both groups completed the same individualised assignment work in professional studies, but the experimental group also microtaught peers on three occasions with feedback stemming from videotape replays of microlessons and supervisory conferences. An analysis of variance on repeated measures with the Teacher Performance Evaluation Scale (taken at the beginning, middle and end of school practice) revealed that the microteaching group gained significantly higher ratings on five out of the six factors that were measured: personality traits, teacher warmth, classroom atmosphere, lesson usefulness and interest in pupils. There was no significant difference between the experimental and control group with respect to the sixth factor, namely, teacher interest in pupil achievement. In addition, several interactions between teaching behaviours and the time variable were noted, with the general trend being towards greater difference between the groups (in favour of the microteachers) near the end of the school practice period.

Other research has directly compared the effects of microteaching and regular coursework in curriculum and instruction by making criterion assessments of teaching performance at the end of each learning experience, or during later practice teaching. Of the studies in this category there were available for review, only one involved the microteaching of school pupils (Limbacher, 1971), while the others asked student teachers to microteach their peers (Emmer and Millett, 1968; Davis and Smoot, 1970; Morse and Davis, 1970; Reed *et al.*, 1970; Butcher *et al.*, 1973).

Davis and Smoot (1970) assigned intact, but essentially randomly-constituted, groups of undergraduate secondary teacher trainees to either a microteaching treatment or a control treatment consisting

of coursework on issues and problems in teaching. Microteaching included two teach/reteach cycles only, used peers as pupils, and was supported by feedback from audiotape replays of teaching as well as by pupil and supervisory comments. Pre- and post-test lessons were analysed using the Laboratory Observation Schedule (LOSCAR), a 13-category system for studying classroom verbal interaction which also yields ratio scores. An analysis of covariance for adjusted means revealed that the microteaching group was significantly superior to the control group on seventeen out of the twenty-two variables measured by the LOSCAR instrument. Microteachers asked more divergent and probing questions, provided more clarification, and increased the variety of their verbal exchanges. In addition, their pupils initiated more, responded more, and received more teacher support. The results in this study would appear to indicate clear superiority for microteaching over regular professional studies coursework in helping student teachers acquire teaching skills. But the investigators cautioned about generalising from their data, suggesting that a possible Hawthorne Effect as well as the use of peer teaching and the influence of microteaching tutors may have unduly favoured the microteaching treatment.

Nevertheless, Davis and Smoot's findings have been supported by other research. Emmer and Millett (1968), for example, used a similar research design but extended the microteaching treatment to ten sessions of peer teaching. Compared with control group subjects who had taken a regular methods course, microteachers were significantly superior in determining the readiness of pupils, motivating pupils, evaluating pupil responses, questioning fluently, and in stimulating more pupil responses and initiations. In a much reduced microteaching provision consisting of one teach and one reteach only, Morse and Davis (1970) also found significant differences in questioning skills between microteachers and a control group undertaking regular coursework.

Butcher *et al.* (1973) experimented with microteaching as a screening device for predicting effectiveness of teaching during school practice. Though their criteria for teacher effectiveness are not clear, they reported that the most consistent predictor of student teaching success was microteaching of peers in 7-minute sessions. The poorest predictor was the single 30-minute microteaching (?) session,

while two coursework treatments which used rôle-playing in reality therapy or discussion of values problems proved to be irrelevant to the subsequent evaluation made of students.

Whereas the preceding studies used peer teaching, Limbacher (1971) examined the relative effects of microteaching high school pupils versus regular coursework in methods which included intensive practice in classroom techniques. Unfortunately, Limbacher did not report on the nature of his microteaching programme except to say that the objective of all microlessons was to increase the awareness of micro-teachers concerning the impact of their teaching. It seems likely that the programme dealt with general rather than specific teaching skills. The criterion measures taken during practice teaching in schools were: (i) pupil evaluations using the Teacher Performance Appraisal Guide (TPAG) and the Illinois Teacher Evaluation Questionnaire (ITEQ); (ii) associate teacher ratings using an early version of the Stanford Teacher Competence Appraisal Guide (STCAG); and (iii) trained observer analyses of the second half of the criterion lesson using Flanders Interaction Analysis (FIAC). As hypothesised, the microteaching group received significantly more favourable pupil evaluations of the specific lesson and of their overall teaching efforts than did the control group. However, the data did not support a second hypothesis that microteachers would be judged by associate teachers to be ready to assume full classroom responsibility earlier than control group members. Nor was there support for a further hypothesis that microteachers would have higher indirect-direct ratios as measured by FIAC. In fact, contrary to this expectation, the control group were more indirect in their teacher influence patterns than the microteachers.

Although Limbacher appears to regard the support of his hypothesis on pupil evaluations as the main finding in this study, the results are mixed. Apart from a lack of reportage on the precise nature of the treatments, there were also experimental control problems in the research design which should be noted when interpreting the results concerning the pupil evaluations hypothesis. It is difficult, for example, to tell whether or not subjects in this study were randomly assigned to treatments. If microteachers were volunteers, then perhaps only 'better' students enrolled for the course. Again, there is no reportage on the controls that were

exercised in the allocation of student teachers to schools, associate teachers and classes. Finally, there is the problem of what constitutes a true control group. Apparently, the same instrument was used for criterion measurement purposes in this study as was used to provide microteachers with feedback, yet the control group had no experience of this instrument. It might be argued, therefore, that the pupil evaluations hypothesis was self-fulfilling. Despite these technical problems, however, Limbacher's study indicates a need for further research on the pupil evaluation variable, not only with high school pupils but with pupils in younger age groups.

Attitudes towards Microteaching

In Ward's (1970) survey of 141 institutions in the United States using microteaching, the changes in student teacher attitude that were most frequently observed by microteaching staff were: (i) a greater appreciation of the complexity of the teaching process; (ii) greater interest in education; (iii) increased self-confidence; and (iv) greater concern for self-improvement and self-evaluation.

Ward's findings have been echoed in a number of studies which have shown that microteaching is regarded by student teachers as an effective training procedure (Wood and Hedley, 1968; Webb *et al.*, 1968; Bloom, 1969; Goldman, 1969; Kohn, 1970; Perrott and Duthie, 1970; Turney, 1970; Davis, 1971; McIntyre and Duthie, 1972; Foxhall and Evans, 1973; Levis *et al.*, 1973). At least two of these studies (Wood and Hedley, 1968; Turney, 1970) have reported that student teachers felt they acquired teaching skills much faster and in a shorter time than they would have done by means of conventional practice teaching in schools. Other studies (Webb *et al.*, 1968; McIntyre and Duthie, 1972; Levis *et al.*, 1973) have found that student teachers regard the skill-by-skill training orientation of the Stanford approach to microteaching as being particularly helpful.

Four attitude studies, however, have struck a negative note. First, in the research conducted by I.D. Gregory (1971), few students gave the component skills orientation their wholehearted support, despite a careful explanation of its rationale prior to the micro-teaching programme. Gregory suggested that tutor influence may have had something to do with this negative reaction; also, that "at least some students were inhibited by a belief that, in a teaching episode,

emphasis on one skill forbade the inclusion of any other" (Gregory, 1971: p.31). In another study by Foster *et al.* (1973) student teachers objected to the one-skill-at-a-time training approach on the grounds that it made teaching unreal, and that it prevented them from carrying out a genuine pedagogical transaction with their pupils. As such, these students felt that skill-by-skill training through microteaching was asking them to practise unethical professional behaviour. Similarly, about a third of student teachers in a study by Waimon *et al.* (1972) felt that microteaching was artificial. In the fourth study (Clift *et al.*, 1974), almost half of the microteachers felt that microteaching gave opportunities for teacher-pupil interaction, yet only about one-quarter believed that the microsetting permitted sufficient practice of specific teaching skills.

Concerning self-confrontation with one's behaviour through video replays, reviews of the literature by Baker (1970) and Fuller and Manning (1973) have indicated that this can be a threatening experience which may result in defensive behaviour, anxiety and stress. Surprisingly, however, there has been little systematic research on the self-confrontation process in microteaching. Bedics and Webb (1971) have shown that microteachers soon overcome "cosmetic effect" or preoccupation with their physical image on the television monitor. Again, some observers have noticed that initial anxiety as a result of video self-confrontation seems to be alleviated once microteachers begin to see the advantages of the procedure, receive positive feedback on their performance, and acquire teaching competencies (Webb *et al.*, 1968; Hughes, 1969; Turney, 1970; I.D. Gregory, 1971; Perlberg, 1971). Nevertheless, in the absence of thoroughgoing research, the possibility remains that self-confrontation in microteaching may have emotional effects similar to those in other settings as indicated in the literature reviews by Baker, and Fuller and Manning.

Very few studies have reported on the reaction of in-service teachers towards microteaching. However, a study by Dugas (1967) revealed a very positive attitude by experienced teachers undertaking a re-training programme in language teaching while, more lately, an adaptation in England of a minicourse from the Far West Laboratory in the United States gained much teacher support (Perrott *et al.*, 1976). In addition, favourable comment was received on a pilot programme developed by Freyberg *et al.* (1974) who experimented with an alter-

native approach to the Stanford model of microteaching. In this study, discrimination learning and sensitisation to a skills repertoire were substituted for imitative practice of a modelled performance, while feedback stressed self-evaluation rather than the supervisory critique. As reported by the investigators, participants stated that "one of the most significant aspects of the experience for them was the opportunity to re-examine the whole activity of teaching -- the many activity components of which they had come to take for granted. They felt they had been able to do this in a professional and co-operative manner, not marred by defensiveness or a need to impress a supervisor. This, they said, enabled them to understand more clearly both the complexity of the teaching situation and the effects of their own interaction with their pupils" (Freyberg *et al.*, 1974: p.17).

By and large, then, the studies reviewed in this section have indicated that microteaching is usually regarded by participants as an effective learning experience. Most of the criticisms and doubts that have emerged in the literature have been concerned with improving the basic microteaching model: there has been no suggestion that this kind of learning procedure should be abandoned altogether.

Is Practice Necessary?

McDonald's account (1973) of the origins of microteaching as a behaviour modification procedure stressed the need for reinforced practice of a teaching skill that had been initially (and covertly) acquired through a modelling and observational learning process. Reinforcement for a skill derived from appropriate pupil response to it during microteaching, and/or from the supervisor during the feedback session that followed. Essentially, therefore, microteaching is based upon the assumption that practising the performance of a teaching skill is necessary for its acquisition.

Several studies, however, have produced findings which tend to question the importance of practice in the microteaching procedure. For instance, Borg *et al.* (1969) trained one group of student teachers in selected teaching behaviours by means of a full modelling/practice/feedback sequence, a second group by modelling and practice experience only, and gave modelling presentations but no practice and feedback opportunities to a third group. An analysis of teaching performance on a post-test revealed that all three groups changed significantly in

their teaching behaviour, but that there was no significant difference between the groups as the result of their differing treatments. Thus the third group's initial learning activity, during which the student teachers simply observed a 30-minute instructional film and then two shorter films for further illustration and discrimination exercise purposes, appeared to have a pronounced effect on subsequent teaching behaviour.

A study at the pre-service level by Friebel and Kallenbach (1969) also revealed no significant difference in teaching performance between a group experiencing an entire minicourse, and another group which had no practice and feedback opportunities. The latter group merely studied training films and written materials related to the skills selected as dependent variables.

Kissock (1971) conducted a similar investigation to that of Friebel and Kallenbach, but included both a post-test and a delayed post-test to assess student teacher performance in high order questioning skills. On post-test performance, the microteachers were superior to those subjects who had been trained just with modelling presentations and verbal directions. However, this superiority disappeared in a further post-test four weeks later.

Contrary to McDonald's view that reinforced practice is necessary for the acquisition of teaching skills, the foregoing studies have suggested that observational learning alone can be just as influential. Close inspection of the modelling procedure in some of these studies reveals, however, that the observational learning from models has usually been supplemented by various types of discrimination learning activity (e.g., visual and/or auditory cueing of skills as they are modelled on a video monitor, discussion examples of appropriate use of a skill by a videotaped model or in written material, and the use of written or oral discrimination exercises). Thus a second proposition arising from the foregoing studies is that the crucial learning experience in microteaching could be the opportunity during the modelling phase to learn to identify and discriminate between different kinds of teaching behaviour.

The possibility that behavioural change by teachers is due to cognitive discrimination learning rather than to observational learning or microteaching practice was tested experimentally by Wagner (1973). This investigator attempted to increase the pupil-centred

teaching behaviour of three groups of student teachers. One group received discrimination training in recognising and coding various categories of teacher behaviour in reacting to pupil statements in the course of a lesson, but no modelling and no microteaching practice were provided. A second group had microteaching practice but no discrimination training or modelling, and the third group had neither discrimination training and modelling nor microteaching practice. On a post-test involving the teaching of a microlesson to peers with whom they were not acquainted, the discrimination training group proved to be significantly more pupil-centred and less teacher-centred than the other two groups.

Wagner's findings may have been different, of course, had the microteaching treatment included a modelling and observational learning component, or if the treatments as researched had been used in an extended programme involving more teaching skills. Nevertheless, one interpretation of Wagner's results is that discrimination training increases the sensitivity of teachers to different kinds of teaching behaviour; and, concomitantly, that this sensitisation produces greater behavioural change in teachers than does imitative practice or practice *per se*.[1]

Notwithstanding this interpretation, the results of several other studies have suggested that observation and analysis of microteaching practice alone may also facilitate sensitisation or discrimination learning that leads to change in teaching behaviour. Goldthwaite (1969), for example, conducted research with pre-service teachers to determine whether the learning of science demonstration skills in a microteaching setting would transfer to subsequent teaching in schools. He was also interested to see whether any learning benefits accrued to student teachers who acted as pupils for microteachers, as distinct from those who had no opportunity to participate as micro-class members. Supervisor ratings of science demonstration lessons during school practice revealed that those student teachers who had been pupils in the microlessons were significantly superior to micro-teachers. The least effective teaching was shown by student teachers who had not participated as microteachers or as microclass members. One possible explanation for these results may be that student

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1 As outlined in Chapter 2, this view was an important element in devising the microteaching programme for the present study.

teachers in the microclass were required to critique the teaching performance of the microteachers. As a result, their discrimination learning or sensitisation to the repertoire of demonstration skills was probably heightened beyond the level attained by microteachers who were not required to analyse their skills closely.

Support for Goldthwaite's findings has been provided by McIntyre (1972) and Freyberg *et al.* (1974). These investigators found that giving teachers opportunity to take part in microteaching as participant-observers -- acting as pupils, as well as being providers of feedback -- produced changes in teaching performance that were equal to those achieved by microteachers themselves. In the study by Freyberg *et al.*, for example, each microteaching group of eight in-service teachers consisted of two sub-groups. Participants attempted to learn 'vicariously' the skills practised by the other sub-group. Prior to microteaching, each sub-group worked separately on audiotaped samples of teaching and learnt to discriminate and code both their own and the other sub-group's practice skill. Subsequently, each teacher had opportunity: (i) to practise his assigned skill when microteaching on adult level material to all other group members; (ii) to act as a genuine pupil; and (iii) to analyse videotape replays of all colleagues' microlessons to provide them with objective feedback. Thus, with reference to the skill <u>not</u> practised, participant-observation included initial discrimination and coding experiences, observation as a pupil of someone else using the skill, and providing feedback information for that person. An analysis of changes in the performance of practice and participant-observer groups on two sets of verbal skills (one practised and the other not practised) showed that there were no significant differences between the groups. Apparently, varied and extensive participant-observation experience had been just as effective as actually practising a skill in bringing about behavioural change.

These findings were contrary to those in a study by Patrick (1972). Student teachers acting as pupils in this study, however, did not actively participate in the feedback process because the microteaching programme called for independent self-evaluation by microteachers. It appears, therefore, that when the participant-observer rôle in a microteaching programme includes active feedback-giving experience, it may well facilitate 'vicarious' learning of teaching skills. In the opinion of Freyberg *et al.*, a likely reason for such learning is that

"... the skills involved in microteaching are already usually part of a person's behavioural repertoire, but for various reasons they are not yet elicited -- or sufficiently or appropriately elicited -- in a teaching context" (Freyberg *et al.*, 1974: p.3). The discrimination experiences available to the participant-observer may be sufficient to bring this elicitation about.

Summary and Comment

It is difficult to summarise the research findings on the general effectiveness of microteaching because the studies reviewed are so diverse in their teaching tasks, the subjects used, their microteaching procedures, and their criteria of successful teaching performance. Again, cross-comparison and interpretation problems arise when studies fail to report operational definitions for dependent variables, or do not provide details on the nature of the microteaching programme that was used (see, for example, the studies by Kallenbach and Gall, 1969; and Limbacher, 1971).

Nevertheless, taken as a group, the studies reviewed in this section appear to indicate that the Stanford approach to microteaching can be an effective means of helping teachers make behavioural changes that lead to the acquisition of a wider repertoire of teaching skills. The main findings from these studies appear to be:

1. Microteaching helps student teachers achieve a repertoire of teaching skills more efficiently than does conventional practice teaching (Allen and Fortune, 1966; Kallenbach and Gall, 1969; Legge and Asper, 1972; Levis *et al.*, 1973).

2. Microteaching is a more effective way of helping student teachers acquire a repertoire of skills than is regular coursework in professional studies (Emmer and Millett, 1968; Davis and Smoot, 1970; Morse and Davis, 1970; Reed *et al.*, 1970, Limbacher, 1971; Butcher *et al.*, 1973).

3. Student teacher performance in microteaching can predict subsequent classroom performance (Allen and Fortune, 1966; Fortune *et al.*, 1967; Kallenbach and Gall, 1969).

4. In general, Stanford-type microteaching is well received by student teachers and is regarded by them as an effective learning experience (Wood and Hedley, 1968; Webb *et al.*, 1968; Bloom, 1969; Goldman, 1969; Kohn, 1970; Perrott and Duthie, 1970; Turney, 1970; Davis, 1971; McIntyre and Duthie, 1972; Foxhall and Evans, 1973; Levis *et al.*, 1973). Similarly, some studies (Dugas, 1967; Perrott *et al.*, 1976) have indicated that in-service teachers also react favourably to microteaching. On the in-service scene, it is interesting to note that at least one study (Freyberg *et al.*, 1974) has shown positive response from teachers when microteaching emphasises participant-observation as pupils, as well as de-emphasising imitative practice models in favour of personal exploration of interrelated teaching skills.

In considering these findings above, it is noteworthy that some research has indicated that the complete modelling/practice/feedback sequence in microteaching may be unnecessary for the acquisition of teaching skills (Borg *et al.*, 1969; Friebel and Kallenbach, 1969; Goldthwaite, 1969; Kissock, 1971; Wagner, 1973; Freyberg *et al.*, 1974). In particular, this research has suggested that the importance attached to the practice component in microteaching has been exaggerated, and that observational and/or discrimination learning may be the sufficient as well as the only necessary condition for behavioural change to occur.

It appears, then, that further research is required on the influence on teacher behaviour of treatments consisting of observation only, discrimination training only, and a combination of these two experiences. A study might also be made in which discrimination or sensitivity experiences are substituted for modelling and observational learning in the presentation phase of a complete microteaching format. Furthermore, cognitive discrimination learning might be more sensitive if a category system were to be used for the analysis of teaching behaviour. As Wagner has said: "Learning to code actual behavior is a paradigm for discrimination learning" (Wagner, 1973: p.3).

While the preceding discussion indicates some directions for

future research, specific problems which are revealed by the literature are noted below, first as cautions against over-generalising from the findings and, secondly, to point up design and measurement difficulties which future research should try to overcome:

1. Evaluation and measurement. It is important to note that studies on the general effectiveness of microteaching have been almost entirely of the process-process type. That is to say, their purpose has been simply to show that microteaching is an effective and efficient means of improving the use of particular teaching skills. To date, the relationship between pupil achievement and the skills that microteaching usually attempts to promote has not been empirically established (c.f., Rosenshine, 1971; Stones and Morris, 1972a, Gall, 1973; Heath and Nielson, 1973).

Studies on the effectiveness of microteaching have relied upon such measures as (i) frequency counts for the use of selected teaching skills; (ii) rating scales; (iii) indices derived from classroom interaction instruments; and (iv) attitudinal scales. The diversity within and across these measures creates difficulties in making valid comparisons of the results for various studies. In addition, the nature of some of these measures suggests that the experimental results in some studies should be regarded with considerable caution.

First, the measurement of microteaching effectiveness has been predominantly by means of global rating scales. A number of studies have failed to report reliability coefficients for their instruments, while the relationships between these instruments and the specific objectives of the microteaching programme have not always been made clear.

Secondly, the findings in some studies may be of doubtful validity because crude pre- to post-test mean gain scores have been used as the criterion measure (e.g., Cooper and Stroud, 1966; Borg *et al.*, 1968, 1969; Acheson and Zigler, 1971; Borg, 1970, 1972). The problems inherent in this type of measure have been well documented (Manning and Dubois, 1962; Lord, 1963; Cronbach and Furby, 1970; O'Connor, 1972; Linn and Slinde, 1977). For example, gain scores from pre- to post-test are not from the same interval scale with the same zero point and they do not take account of the influence of regression effects which can distort results. Moreover, a loss score may sometimes represent a gain. Thus, in a previously cited study by Freyberg *et al.* (1974),

although microteaching reduced the frequency with which teachers asked high order questions, this apparent loss really meant that teachers asked fewer but better quality questions which elicited more and longer pupil responses. In short, there were fewer opportunities for the teachers to ask questions.

Thirdly, data from attitudinal scales and informal interviews on microteaching effectiveness need to be treated cautiously. Such data can provide useful descriptive information and may be used to guide future programming and research. However, as Stones and Morris have noted: "... it is not known to what extent student teacher attitudes and their teaching performance are related" (Stones and Morris, 1972a; p.96). In other words, one cannot assume that positive acceptance of a microteaching experience also indicates that it has been effective in improving teaching behaviour.

2. Control group experiments. Future microteaching research needs to consider carefully what constitutes a true control group in control group designs. As Clift *et al.* (1974) have pointed out, to make a valid comparison of microteaching and some other treatment, the basis for the analysis of teaching performance and the actual content covered should be the same in the case of each treatment. Only the procedures should differ. In some of the studies which claim superiority for microteaching over other treatments (see, for example, Kallenbach and Gall, 1969; Limbacher, 1971), this kind of experimental control has been lacking.

3. Experimental subjects. Most of the studies reviewed have involved secondary rather than elementary school pupils and have made use of peer teaching more than they have the teaching of school children. It is important to bear these points in mind when attempting to generalise from the research on microteaching effectiveness.

4. Microteaching and conventional practice teaching. It is doubtful whether the research that has compared the effectiveness of microteaching and conventional practice teaching in schools serves any useful purpose. Microteaching that follows the Stanford model is a highly controlled procedure for developing specific teaching skills. Conventional practice teaching, on the other hand, has wider and more integrative objectives related to the planning, teaching and evaluation process. Comparison of these two learning experiences raises once

more the problem of what constitutes a true control group. A meaningful comparison of microteaching and practice teaching in schools requires that both learning experiences have the same objectives and content, yet research to date has not been mindful of this criterion: a school practice programme extends beyond the scope of microteaching, while microteaching is too limited in scope to meet all school practice objectives.

Research Studies Investigating Components within the Microteaching Format

Most research on microteaching has been directed towards finding the most effective way of implementing the Stanford model as a training procedure. Thus, many studies have examined the relative effects on teaching performance of manipulating as independent variables different elements within the presentation, practice and feedback phases of the basic microteaching format. This three-phase format provides a convenient framework for reviewing these studies, in particular those in which the research variables have borne close relationship to the concerns of the present investigation.

1. The Presentation Phase

As discussed in Chapter 2, the Stanford approach to microteaching draws much of its rationale from the theoretical and empirical research on modelling and observational learning (Bandura and Walters, 1963). Typically, therefore, a microteaching training sequence begins with a presentation phase in which a teacher models a particular skill for which he is positively reinforced by pupil attention, motivation or learning achievement. As a result, it is claimed that microteacher observers not only come to value the modelled skill, but that they develop a clear "perceptual blueprint" of it before attempting to shape their own behaviour after that of the model during subsequent microteaching (Sheffield, 1961; Orme, 1966; McDonald and Allen, 1967).

A number of studies on microteaching have provided evidence that some kind of modelling procedure does, in fact, have significant effect on teacher behaviour (Orme, 1966; Allen *et al.*, 1967; McDonald and Allen, 1967; J.J. Koran, 1968; Claus, 1969; J.J. Koran, 1969, 1970,

1971; Young, 1968; Ebert, 1969; Higgins *et al.*, 1970; Eder, 1971; Lange, 1971; Patrick, 1972; White 1972; Levis *et al.*, 1973). Indeed, as discussed in the preceding section on the general effectiveness of microteaching, there is some evidence to suggest that observation of videotaped or filmed teaching models alone may be as influential on teacher behaviour as opportunity to observe such models combined with microteaching practice (Borg *et al.*, 1969; Friebel and Kallenbach, 1969). However, the research on modelling is far from being conclusive concerning the relative efficacy of:

(i) different modelling media, and
(ii) different forms of presentation for teaching models.

Modelling Media

A number of studies have investigated the relative effectiveness of visual-perceptual models (videotaped or filmed teaching sequences), audio-perceptual models (audiotaped teaching sequences), and symbolic models (written transcripts of teaching sequences and/or written descriptions, examples and directions on how to use skills).

Some of these studies have provided evidence to support the use of visual-perceptual rather than symbolic models in microteaching. For example, M.L. Koran (1969) found that filmed models were significantly more effective than written descriptions of skills in helping student teachers increase the frequency, variety and quality of their analysis questions. Similarly, J.J. Koran (1969) found that student teachers who were exposed to videotaped models were significantly superior in the writing of observation-classification questions to those students who received written guidelines on the use of this question type.

Orme (1966) examined the relative effects of visual-perceptual and symbolic modelling on increasing pre-service teachers' use of probing questions and, as he predicted, found that visual-perceptual modelling was generally more effective. In addition, Orme's data gave partial support to a further hypothesis that a combination of visual-perceptual and symbolic modelling would be significantly more effective than either procedure alone.

The efficacy of combining these two forms of modelling, however, has not been substantiated by subsequent studies. For example,

McDonald and Allen (1967) examined the effects of visual-perceptual versus symbolic models under differing feedback conditions. They found that a combination of the two modelling modes (with supervisor comments on the perceptual model and feedback on a video replay of microteaching) produced significantly greater increase in probing questions than did a symbolic model and no-feedback treatment. Unfortunately, however, no subjects in this study received a visual-perceptual or symbolic modelling treatment alone combined with the same type of video feedback, so that it is difficult to tell whether the results were due to feedback or modelling effects. In another study, Young (1969) found no significant differences between subjects who experienced visual-perceptual-symbolic modelling and those who received a symbolic modelling treatment only.

A few studies have found visual-perceptual and symbolic modelling to be equally effective in bringing about change in teacher behaviour. Allen *et al.* (1967), for example, found that a videotaped model was no more effective as a training procedure than study of a written description of skills for increasing the use of high order questions by secondary teacher trainees. However, while these investigators suggested that videotape technology may be superfluous for modelling purposes when a verbal skill such as high order questioning is the training focus, they noted that this may not be the case for other skills, especially those involving motor behaviours. Moreover, they pointed out that the effects of the symbolic modelling treatment in their study may have been confounded by an overall training effect that was mediated by the constant treatment of self-viewing of the video replays of microteaching which accompanied both types of modelling condition.

Nevertheless, Gall *et al.* (1972) also found that instructional videotapes and transcripts of these videotapes were equally effective modelling procedures for helping teachers make significantly greater gains in their use of high order questions. In addition, a study by J.J. Koran (1970) compared modelling with a problem-solving method and produced no differences in effect between visual-perceptual and symbolic modelling. But the findings in this study are suggestive only because, although group means were arrayed according to prediction, differences between the means were not statistically significant.

Clearly, results from the foregoing studies have indicated no

consistent superiority for visual-perceptual models over symbolic models. It appears that the predominant use of videotaped models by microteaching practitioners and researchers is based on their belief in its superior motivational powers (c.f.,Borg *et al.*, 1970). Just the same, two studies have researched the viability of the less expensive audio-perceptual mode. White (1972) combined audio models and written transcripts of these models for training pre-service teachers in indirect verbal behaviours. Using Flanders Interaction Analysis as the criterion measuring instrument, White found that the experimental group which studied the combined model four times produced significantly more indirect teaching behaviour than did a control group which had no modelling treatment. In another study related to counselling, Myrick (1969) compared the effectiveness of audio and videotaped models. Discussing the finding that audio models were more effective than video models in eliciting self-reference statements, Myrick suggested that this was because audio and symbolic models contain less distracting and irrelevant information.

Forms of Modelling

Research on the most viable form for the presentation of models to microteachers has been concerned solely with the video mode and may be considered under two headings:

(i) Modelling focus.
(ii) Cueing of models.

Modelling focus. In this research area one question has been whether a pure model (one which exhibits only the target behaviour) is superior to a mixed model (one which exhibits both the target behaviour and behaviours which the microteaching programme wishes participants to avoid). Allen *et al.* (1967) compared these two focuses with respect to training secondary teacher trainees in the use of high order questioning skills. One group of subjects observed a teacher modelling high order questions only (the pure model) while another group observed both low and high order questions being modelled. The investigators reasoned, on the one hand, that the mixed model might allow for discrimination training with contrasting stimuli, the negative example of low order questioning serving to clarify the characteristics of the behaviour to be learned. On the other hand, the

mixed model could be ineffective because of interference or masking effects. The results showed that modelling only positive instances of high order questioning was more effective in helping subjects use this skill in a new teaching situation. Generalisation for this finding, however, needs to be tempered by the fact that this study dealt with one verbal skill only, and that neither experimental treatment revealed any significant training effects. The present reviewer could locate no other studies in the microteaching literature which have investigated the problem of pure versus mixed models. It seems reasonable to assume, therefore, that this research question remains open.

A second problem for modelling focus concerns the use of "constructed" models versus "naturalistic" models from the classroom setting. Commonly, microteaching programmes employ constructed models: that is, models which have been planned, rehearsed and refined to meet specific criteria for the use (albeit exaggerated) of a particular skill. Orme (1966), for example, requested his teacher models to emit 10-15 probing questions within a 5-minute teaching session.

The superiority of "constructed" models over those drawn from a pool of video-taped recordings made in classroom settings is assumed rather than proven. In fact, to the present reviewer's knowledge, no studies have made a direct comparison of the effectiveness of "constructed" versus "naturalistic" models. Young (1968) found that the combination of a videotaped model with contingent focus (cueing of skills on the video soundtrack) and a videotaped specific illustrations model (a teacher giving discrete examples of a skill without pupils being present) was more effective than either of these two models alone. But both Young's models were of the "constructed" type. Again, Emmer and Sullivan (1969) evaluated a videotape modelling module on six motivating strategies which were demonstrated in the relevant parts of five lessons selected from a large number of lessons videotaped in the classroom setting. They found no significant differences between subjects in a modelling and no-modelling group either in ability to arouse pupil interest, or in the frequency with which each motivating strategy was used. Two possible reasons for this finding were suggested by the investigators: (i) the lack of auditory or visual cueing of the modelled skills, and (ii) the complexity of the tasks, which might have been subdivided into smaller component

skills.

While the use of "constructed" models has predominated in micro-teaching, it cannot be assumed that the most effective modelling procedure is to focus on the teacher's behaviour only. Koran *et al.* (1972), for example, showed that when the three sources of information in a model situation (the teacher only, the pupils only, and the teacher and the pupils together) were considered, the observation of teacher and pupils together had most effect on subsequent teaching performance. The least effective modelling treatment was observing the teacher only.

The results of the Koran *et al.* study may well indicate the importance of sensitising microteachers to various cues in the teaching-learning environment which signal the need for some kinds of teaching behaviours rather than others. In turn, this suggests the need to present a variety of models related to a given skill in order that microteachers may acquire "the class of teaching behaviour without the idiosyncratic features of any single model's performance." (Stones and Morris, 1972a: p.141).

Indeed, one criticism made of the Stanford approach to micro-teaching is that it may encourage slavish imitation of a particular model's behaviour, and thus discourage development of a personal and creative teaching style. This criticism gathers strength when one considers: (i) that most microteaching programmes present one or two models only for each skill, and (ii) that video replays of teaching performance for feedback purposes are often used by supervisors to positively reinforce only those behaviours which match those presented in a previously observed model. Allen *et al.* (1967) tested the viability of this kind of criticism by having some student teachers teach the same lesson as a model while others taught a lesson of their own choosing. In a final training trial, both groups of trainees taught a lesson of their own choosing thus providing a test of the transferability of the skills which were observed and to be acquired. Although trainees who practised the same lesson as the model initially exhibited significantly more of the desired teaching behaviour, differences between the two groups disappeared in a subsequent transfer lesson.

It is possible that generating new instances of a teaching skill

may be hindered rather than assisted by too much emphasis on the teaching model as a "model teacher". Such emphasis may run counter to, for example, the theoretical proposition in the Stanford approach to microteaching that was outlined in Chapter 2, namely, that modelling encourages the development of perceptual blueprints (Sheffield, 1961) which facilitate flexible use of a class of skills rather than the reproduction of specific S - R sequences portrayed by a teacher model. In this regard, the results of a study by Resnick and Kiss (1970) not only tended to support the use of a variety of models, but also suggest that analysis rather than observational learning should be the focus in the presentation and feedback phases of the microteaching format. Student teachers in this study who experienced a variety of exemplars were better able to use flexibly and to "self-edit" a range of behaviours related to the diagnosis of young children's intellectual skills.

Finally, some research on the question of focus for models has attempted to show that the personal characteristics of observers and models (e.g., level of expertise, sex, age and physical appearance) may affect reception of a model by microteachers and hence their subsequent teaching performance. Two studies on this theme produced results that are suggestive only, and both dwell on the possible influence of discrepancy between the level of professional expertise in the model and the microteacher. With regard to the use of questioning skills, J.J. Koran (1968) found a tendency for student teacher models (or these models in combination with experienced teacher models) to be more effective than experienced teacher models. Again, Meichenbaum (1971) recommended the use of "coping" models which show a teacher gradually achieving mastery of a skill because these models induce greater confidence in the observer to attempt the same skill than if an 'expert' portrayal is observed.

Cueing of models. Cueing of a visual-perceptual model by visual or auditory means appears to be a useful procedure for helping microteachers attend to and discriminate instances of a modelled skill (Young, 1968; Claus, 1969; Ebert, 1970). In Young's study, for example, it was found that a contingent focus for perceptual models (visual and auditory cueing of a skill on the video soundtrack and monitor respectively) was a more effective treatment than using a non-contingent focus with models (providing separate written or verbal

instructions on a skill). Claus (1969) experimented with the supervisor giving verbal cues for skills as these occurred in a videotaped model and found this procedure to have significantly more effect on performance in high order questioning than did feedback, with or without cueing.

Borg *et al.* (1970) have advocated the use of exercises to help microteachers discriminate between certain skills and to consider their effects on pupil behaviour. More active participation still was asked of microteachers by Bjerstedt (1967) who recommended that a videotaped model should be stopped at crucial points so that microteachers could relate what had occurred, or could suggest what they would do in similar circumstances. Here, then, is a special type of cueing that leans towards analysis rather than imitative learning as the focus for the presentation phase in the microteaching format.

Summary and Comment

Evidence has been cited in this section from a number of studies which would support the use of modelling in microteaching. However, the research literature provides few, if any, guidelines to microteaching practitioners concerning either the relative effectiveness of different media, or the most viable form for the presentation of teacher models.

Research findings on the effectiveness of visual-perceptual modelling has been inconsistent. Some studies (Orme, 1966; J.J. Koran, 1969; M.L. Koran, 1969) have indicated that visual-perceptual modelling is superior to symbolic modelling. Other research, however, has shown that these two media are equally effective, or has suggested the possibility that symbolic modelling is sufficient for the acquisition of some skills -- perhaps those that are most easily described in words (Allen *et al.*, 1967; Myrick, 1969; J.J. Koran, 1970; Gall *et al.*, 1972; White, 1972).

Although research evidence is lacking (c.f., Orme, 1966; McDonald and Allen, 1967; Young, 1969), Berliner (1969) has recommended that a combination of visual-perceptual and symbolic modelling should be used in microteaching until such time as a taxonomy outlines a classification that provides information on which skills should be visually modelled and which should not. This recommendation, of course, takes no account of the possibilities in using the audiotape mode. Only two

studies could be located which have incorporated auditape modelling (Myrick, 1969; White, 1972), but the results in favour of audiotape suggest that there is a need for further research which directly compares the relative impact on teaching performance of the audio and video modes.

By and large, research into the most effective form for the presentation of models has been no more conclusive than that related to modelling media. While most microteaching programmes use constructed models, no study appears to have directly compared the effect on teaching performance of "constructed" and "naturalistic" models. Again, findings have been equivocal in the studies which have examined the relative effectiveness of pure and mixed models (c.f., Allen *et al.*, 1967).

Stronger but not conclusive evidence is available regarding the need to include both the teacher and his pupils in a modelling presentation (Koran *et al.*, 1972), and to present a variety of experienced and less experienced teacher models (J.J. Koran, 1968, Resnick and Kiss, 1970; Meichenbaum, 1971).

The most convincing empirical evidence on modelling, however, appears to be that which supports the need for cueing of skills (Young, 1969, Claus, 1969; Borg *et al.*, 1970; Ebert, 1970). Notwithstanding this evidence, cueing in some studies does appear to have been more concerned with discrimination training, analysis, and sensitisation to the effects on pupils of different teaching skills that it has with modelling effect and imitative practice (see, for example, Bjerstedt, 1967; Borg *et al.*, 1970).

This observation has relevance to the suggestion made at the end of the previous section when commenting on the general effectiveness of microteaching, namely, that there is need for research which emphasises discrimination learning and analysis instead of modelling in the presentation phase of the microteaching format. There, it was also suggested that a study might be made of the relative effects on teaching performance of following discrimination training with a practice and no-practice condition. Because of its emphasis on cognitive discrimination learning and sensitisation to different teaching skills, such research would lean towards the use of "teaching samples" rather than "models" or "exemplars". To best aid discrimination learning, these samples might include both positive and negative

instances of different skills.

The question remains, however, as to whether such teaching samples should be presented on videotape, audiotape, or as written transcripts. As reviewed in this section, microteaching studies on modelling offer insufficient guidance on this problem. It would appear, therefore, that a study is required which examines the relative effectiveness of these presentation media within the context of a discrimination learning and sensitisation approach to microteaching.

2. The Practice Phase

In the second and third phases of the Stanford microteaching format, a participant plans and teaches a lesson in which he attempts to imitate the behaviour of a model, receives feedback, and then practises again. This reteaching cycle is completed under micro-conditions involving reduction in teaching time, lesson content and the number of pupils taught. In this way, the complexities of normal classroom teaching are minimised, thus offering microteachers a 'safe' practice environment in which to concentrate on a previously modelled teaching skill.

Research on the practice phase in microteaching has been mainly concerned with identifying what composition for the microclass, and what amount of practice, will best facilitate performance gains in the component skills of teaching. The research questions most commonly asked have been:

(i) What is the optimal size for a microclass?

(ii) Is microteaching of adult peers as effective as microteaching school pupils?

(iii) How many teach/reteach cycles are necessary within the modelling/practice/feedback sequence?

There is an assumption in these questions that microteaching practice is a necessary condition for the acquisition of teaching skills. Research evidence which tends to contravene this assumption has already been reviewed and will not be discussed again. But if practice is desirable, what particular form should it take?

Size of Microclass

Ward's (1970) survey of microteaching programmes in American teacher education institutions revealed that most of them used microclasses of six or less pupils. While no study appears to have investigated specifically the problem of optimal class size in microteaching, observations during a pilot study at Sydney Teachers College (Foster *et al.*, 1973) suggested that size of the microclass may determine the kind of teaching skills that are able to be practised. Student teachers in this study reported two restrictions felt by them as a result of microteaching 4-5 pupils. First, for reasons that were not always clear, pupils were sometimes unresponsive to indirect discussion-style teaching and student teachers felt compelled to use an expository teaching mode. At other times, however, pupil-to-pupil talk was so excessive, as well as being digressive and conversational in nature, that the cognitive quality of the microlesson was much reduced. Student teachers felt that these contrastive interaction patterns were not representative of regular classroom teaching and thus precluded them from practising the skills which they needed to develop. On the basis of such evaluations, Foster *et al.* suggested: "By increasing class size to, say, ten, it may be possible to reproduce interaction situations which resemble more closely those of a normal classroom and yet retain the advantage of a small group" (Foster *et al.*, 1973: p.116).

Clearly, the concern of Foster *et al.* and their student teachers is with transfer of the skills practised during microteaching to the classroom setting. However, increasing the size of the microclass would tend to multiply the logistic problems already facing any microteaching programme which attempts to provide for large numbers of participants. Indeed, pupil availability as well as financial, transportation and scheduling difficulties have prompted many teacher education institutions in the United States to use student peers rather than school children as microclass pupils (Ward, 1970).

Teaching Peers vs. Teaching School Pupils

While the use of student peers as pupils offsets a number of administrative problems in microteaching, the question arises, first, as to whether this procedure permits microteachers to practise the same kinds of skills as they might practise with school pupils and,

secondly, whether the skills practised with peers transfer to subsequent teaching in the regular classroom.

On the first question, opinion appears to be divided. Allen and Ryan (1969) have argued against the use of peer pupils on the grounds that peer teaching is simulated rather than real teaching, as well as being 'too safe' and demotivating. Foster *et al.* have suggested that "the maturity of peers and their understanding of the content lead to quite different treatments of questions, answers, and pupil-initiation of discussion in microlessons" (Foster *et al.*, 1973: p.114). Thus they have said that when a microteacher uses typical school content in his microlessons, both he and his peer pupils tend to lapse into artificial rôle-playing; furthermore, that attempting to overcome this artificiality by teaching content at the more complex adult level is likely to result in a content emphasis which prevents sufficient attention being paid to the practice of specific teaching skills.

Similarly, Wood and Hedley concluded from their microteaching study on questioning skills that "... Questioning the peer group began to show a diminishing return due to the background knowledge of the students, and to their development of a sense of anticipation" (Wood and Hedley, 1968: p.50). When school pupils were substituted for peers later in Wood and Hedley's programme, it was observed that the 'realism' helped maintain microteacher interest.

Other studies, however, have indicated that teaching peers and teaching school children in a microteaching setting are equally effective means of promoting teaching skills albeit that, in some cases, student teachers have expressed a preference for teaching children. For instance, Collefello *et al.* (n.d.) randomly assigned student teachers to a treatment involving four microteaching sessions with high school pupils, or to a second treatment in which the first and last microlessons were with high school pupils and the second and third were with fellow college students. All microteachers were video-taped and rated by members of the microclass using a pre-test evaluation instrument. Although a statistical analysis revealed no significant difference between the two groups regarding teaching performance, student teachers believed that microteaching high school pupils was more realistic. Nevertheless, these same student teachers thought that evaluation of their teaching should be made by a professionally trained supervisor and their peers rather than by school

pupils. Hoerner (1969) and Patrick (1972) have also reported finding no significant difference between the microteaching of peers and the microteaching of school pupils in bringing about improvement in the handling of teaching skills.

In a previously cited study involving pre-service secondary school teachers, Levis *et al.* (1973) found that those who taught high school pupils performed at a significantly higher level in the use of high order questioning than did those who worked with peer pupils. However, there were no significant differences between the two groups with respect to questioning fluency and the use of probing questions. This study also gave an indication that peer teaching may have special advantages for both microteachers and their peer pupils. Despite expressing a preference for microteaching high school pupils, trainees agreed that microteaching of peers did not inhibit their teaching, that playing the pupil rôle presented few difficulties, and that peer group microclasses provided more effective feedback than high school pupils. Of special interest was the general acceptance by trainees that "acting as a peer pupil sensitised them to the skills being practised." (Levis *et al.*, 1973: p.16). This finding is similar to that of Freyberg *et al.* (1974) who, as previously reviewed, observed that participant-observation as pupils and providers of feedback in a microteaching programme was as effective as actually practising a set of skills.

In the study by Levis *et al.*, teacher trainees were "equally divided on the question whether it is difficult to teach school pupils after having training sessions with peers." (*ibid*: p.16). Several investigators have examined this problem. For example, Steinbach and Butts (1968) randomly assigned elementary school student teachers during a science methods course to one of four experimental treatments, all of which involved low teacher-pupil ratio teaching with a focus on scientific processes, behavioural objectives and inquiry teaching. The four treatments consisted of either teaching children or teaching peers, each accompanied by either a feedback or a no-feedback condition. While the results generally indicated that trainees who taught peers developed competencies and attitudes similar to those who taught children, Steinbach and Butts concluded that microteaching of children appeared to be necessary in order to attain certain interaction and pacing skills. Trainees who taught children used questions and

clarified pupil responses more, had to spend longer time on goal clarification, and had to handle more pupil interruptions. In peer teaching, the microlessons were shorter and ran more smoothly because the pupils focused quickly on the lesson's goal and the microteacher was able to make greater use of their responses. Steinbach and Butts commented that if microteaching involved peer teaching alone, important pacing skills that are required when teaching children could be poorly developed. Hence they recommended that several sessions of microteaching with peers should be used to establish most skills, followed by several sessions with children to further develop these skills and to learn how to make necessary pacing adjustments.

A similar recommendation has been made by Emmer (1971) who tested the transferability of skills attained through the teaching of peers to the teaching of children (both in a microteaching setting). Following a pre-test using peers as pupils, microteaching was organised so that secondary school teacher trainees taught a series of microlessons to their peers, one microlesson to Grade 6-8 pupils, and a post-test microlesson once again to their peers. A transfer effect was viewed as plausible if performance during the microlesson with children was maintained at or above performance levels in the peer teaching session immediately preceding it. The criterion measures were ratings on the four teaching dimensions of determining readiness, clarifying objectives, motivating and evaluating, as well as two descriptive measures of teacher indirectness and amount of pupil talk derived from an application of Flanders Interaction Analysis. Not only did subjects maintain their performance level from peer teaching to the microlesson with children, but they made significant and unexpected gains in the dependent variables of determining readiness, motivating, evaluating and indirect teacher talk. Except for the latter, these increments were all maintained in the post-test lesson with peers.

Emmer has suggested that the unexpected increase in teaching performance in the microlesson with children might have been due to the added incentive to plan more thoroughly and to attend more closely to teaching skills. It seems reasonable to assume also that some of the skills measured would be more likely to be used with children than with peers, e.g., indirect teaching behaviours such as accepting feelings, praising and using pupil ideas. Because most of the increases in performance during the microlesson with children were

also maintained in the post-test lesson with peers, Emmer has suggested further that the microteaching of children has a transfer effect. One explanation he offered for this was greater teacher understanding of strategies and behaviours that are likely to be effective; another was that the teachers developed more motivation resulting from a realisation that what was being learned in peer teaching would help them work more effectively with school pupils. Emmer's overall conclusion was that when it is necessary to use peer teaching in order to implement microteaching programmes, attempts should be made at least occasionally to introduce school pupils into the teaching experience.

Of course, the true test for the transferability of skills acquired through microteaching is their application in actual classroom settings. As discussed earlier in this chapter, investigations of such transfer have produced mixed results. For example, Allen and Ryan (1969) claimed a transfer effect, yet Kallenbach and Gall (1969) found no such evidence. In Emmer's view (1971: p.178), lack of transfer, or at least the problem of detecting evidence for it, may be due to several factors: (i) Teachers may not acquire the skills sufficiently during microteaching; (ii) assessed behaviours may be different from those which were learned in microteaching; (iii) the acquired behaviours may have been extinguished; or (iv) the acquired behaviours might be unusable in the classroom setting to which transfer is expected.

Johnson and Pancrazio (1971) investigated this transfer problem with specific reference to the relative effects of microteaching peers and microteaching school pupils. Social Studies method students were assigned for a total of six microteaching sessions to one of three treatments: microteaching peers, microteaching university freshmen, and microteaching high school pupils. Assessments of teaching performance were made at the beginning and end of microteaching using the Illinois Teacher Performance Appraisal Scale (TPAS) and, during subsequent practice teaching in schools, using the Illinois Teacher Evaluation Questionnaire (ITEQ). Student teachers who practised microteaching with high school pupils were significantly superior to those in the other two groups. Thus Johnson and Pancrazio questioned the widespread use of peers as microteaching pupils, although they acknowledged that the subjectivity of their measuring instruments and

certain weaknesses in their sampling made it important that their study be replicated using improved experimental controls.

The Teach-Reteach Cycle

As outlined in the introduction to this section, the practice and feedback phase in the microteaching format are usually integrated in what is called the teach-reteach cycle. This procedure affords the microteacher an opportunity to utilise ideas and suggestions from feedback on his first microlesson in teaching this same lesson to a different group of pupils. However, according to Ward's survey (1970), many microteaching programmes in the United States have dispensed with the reteach session. It is likely that this has been due to the additional logistic problems that the reteach session entails.

At the University of Chicago, Guelcher *et al.* (1970) have modified the Stanford teach-reteach cycle on the grounds that it does not encourage purposeful practice of teaching skills. In endeavouring to implement the Stanford model of microteaching, these researchers observed that all too often there was no significant improvement in teaching performance between the teach and reteach sessions. Moreover, it appeared that the reteaching of a new group of pupils often recast the lesson so completely that the relationship between the two microlessons was lost. Above all, microlessons seemed to lead nowhere in terms of educational objectives. In other words, teaching skills seemed to be practised for their own sake instead of for the facilitation of learning by pupils.

As a result of these observations, microteaching at the University of Chicago has abandoned the Stanford teach-reteach cycle in favour of shared supervisor-microteacher planning which emphasises: (i) the relationship of a microlesson to the general objectives and content of a larger-scale curriculum topic; (ii) the need to state clearly the specific teaching objectives related to this topic; and (iii) a psychological and logical basis for the use of particular teaching skills.

Guelcher *et al.* have claimed that this dynamic skills approach is superior to the component skills orientation of the Stanford microteaching model in that it mediates far more satisfactorily between theory and practice "by introducing logic (of the lesson), theory (of

psychological principles) and life problems (both of people involved and subject handled)" (Guelcher *et al.* 1970: p.7). Consequently, a microteacher finds that he is able to revise his plans during the teach as well as the reteach in the light of pupil response. Furthermore, a teach/reteach sequence often produces what Guelcher *et al.* have called a "nuclear lesson", one which generates pupil questions and data input that naturally and logically results in several follow-up microlessons. In this way, an effective bridge is built between microteaching and classroom teaching.

Only one study (Clift *et al.*, 1974) could be located which has specifically researched the relative effects on student teachers' teaching performance of differing numbers of teach-reteach cycles. As measured by a summed score on three rating scales related to questioning and demonstration skills used in the task of set induction, no significant difference in pre-test to post-test performance was found between groups receiving four and six teach-reteach cycle opportunities.

No research appears to have investigated specifically the optimal number of reteach sessions for acquiring different teaching skills. In practice, microteaching programmes have tended to provide one reteach opportunity only per teaching skill, and have adopted the principle of distributed rather than massed learning by allowing an interval between the teach and reteach sessions for replanning and revision purposes. Evaluation of the first summer school clinics at Stanford University 1963-1965 (Fortune *et al.*, 1967) indicated no significant change in student teachers' behaviour as measured by pupil ratings when this reteach was scheduled immediately following the teach session. In the 1966 clinic, use of a 15-minute break for planning a reteach produced observable change in some skills but not in others (Allen, Fortune and Cooper, 1968). Subsequently, Stanford microteaching programmes have incorporated a 24-hour time interval between the teach and reteach sessions but no published data could be located by the present reviewer on the results of this shift.

Minicourses developed by Borg *et al.* (1970) at the Far West Laboratory for Educational Research and Development appear to have adopted the Stanford approach of a 24-hour break between the teach and reteach. It is noteworthy, however, that Levis *et al.* (1973) found no significant difference in the use of questioning skills between

secondary school teacher trainees who received a "refinement break" of 20 minutes, and those who had a one-week break. Moreover, both groups of trainees expressed satisfaction with their respective interval allocations.

Summary and Comment

There is a paucity of research in microteaching on the questions of optimal size of the microclass and the number of reteach sessions that are required in order to produce significant behavioural change in microteachers. Recommendations on the size of the microclass have *a priori* rather than empirical bases (see, for example, Foster *et al.*, 1973).

Similarly, no empirical studies have specifically investigated the problem of identifying the number of reteach sessions which best promotes skills acquisition -- or even whether it is necessary to have a reteach.

Of the little research that is available on the teach/reteach question, most has attempted to identify the optimal time interval for review and replanning purposes between the two sessions. The findings here tend to be inconclusive and contradictory (see, for example, Allen, Fortune and Cooper, 1968; Borg *et al.*, 1970; Levis *et al.*, 1973). Apart from a general indication that very close proximity for the teach and reteach may not be advisable, identification of the optimal break between the two sessions appears to be a matter for future research.

Pupil availability, as well as finance, transportation and scheduling difficulties appear to have motivated a number of American teacher education institutions to use peer teaching rather than the teaching of school pupils in their microteaching programme (Ward, 1970). This procedure is regarded as being ineffective by some microteaching practitioners and researchers (Wood and Hedley, 1968; Allen and Ryan, 1969; Foster *et al.*, 1973) because it lacks the reality that is necessary to facilitate the practice of typical classroom skills, to motivate microteachers, and to ensure transfer of acquired teaching behaviours to the classroom setting.

However, the research evidence is largely inconclusive concerning teaching peers versus teaching children. Some studies have indicated

that these two approaches are equally effective means of improving teaching performance (Collefello *et al.*, n.d.; Hoerner, 1969; Patrick, 1972). In two studies (Levis *et al.*, 1973; Freyberg *et al.*, 1974), peers who acted as pupils stated that the experience helped them become more sensitised to different verbal teaching skills.

Nonetheless, on the crucial question of transferability for teaching skills from microteaching peers to teaching children in either a microteaching or classroom setting, few studies have been conducted and their findings are somewhat conflicting (Steinbach and Butts, 1968; Emmer, 1971; Johnson and Pancrazio, 1971). Although peer teaching provides a 'safe' environment for the accomplishment of teaching skills, it appears that lesson pacing problems, which are commonly experienced when teaching children, are not catered for in the peer teaching situation. For this reason, some investigators (Steinbach and Butts, 1968; Emmer, 1971) have recommended that peer teaching leading to teaching of children should be built into the one microteaching programme. By and large, however, the relative effectiveness of teaching peers and teaching children in microteaching is still an open question in need of further research.

3. The Feedback Phase

The feedback phase in microteaching is commonly known as the critique session and is generally regarded as an essential component in the microteaching format. In attempting to identify the optimal means of giving feedback to microteachers, researchers frequently ask:

(i) Is the videotape replay of teaching performance necessary, or can equal or better effect on teaching behaviour be achieved by an audiotape replay?

(ii) Who best provides feedback -- a trained supervisor, the microteacher himself, pupils in the microclass, or fellow microteachers?

While researchers have been preoccupied with these questions, far less attention has been given to the relative effects on teaching performance of different types of feedback, e.g., reinforcing, motivational and informational feedback (Annett, 1969). Findings on this aspect of the feedback process may ultimately determine answers to the two questions above.

Video vs. Audio Feedback

Although microteaching practitioners acknowledge that it is possible to conduct microteaching without the aid of videotape feedback, the video replay of teaching performance is a characteristic feature of the majority of microteaching programmes. Thus Ward's (1970) survey of teacher education institutions in America using microteaching showed that 50 percent of them used the video replay more than 75 percent of the time, and 21 percent used it more than 25 percent of the time. Indeed, two of the earliest studies of microteaching were concerned with the effectiveness of video feedback. These studies were conducted by Acheson (1964) with secondary teacher interns at Stanford University and indicated (i) that videotape self-evaluation and pupil feedback were superior to supervisory feedback; and (ii) that supervisory feedback based on a video replay of teaching performance was superior to supervisory comments alone.

Subsequent to Acheson's work, a number of empirical studies on microteaching at Stanford University and elsewhere have provided consistent evidence that the video replay of a teaching performance is an effective feedback procedure (see, for example, Berliner, 1969). The advantages said to accrue from this form of feedback may be summarised as follows:

1. An original teaching performance can be reinstated in a relatively complete, objective and reliable manner, thereby providing the supervisor and teacher with a common frame of reference which facilitates constructive criticism, discrimination training and reinforcement of salient teaching skills by the supervisor (Orme, 1966; McDonald and Allen, 1967; Young, 1968; Berliner, 1969; Olivero, 1970).

2. Microteachers are more amenable to criticism when it is directed to their image on the television monitor than when it is directed at their person (Cooper, 1967; Wood and Hedley, 1968; Turney, 1970).

3. For some behaviours (e.g., non-verbal teaching skills), video feedback is the only means of helping teachers become aware of their behavioural tendencies (Olivero, 1970).

4. Video feedback increases the flexibility of the micro-teaching procedure (Goodkind, 1968). This flexibility extends from immediate to delayed feedback possibilities (McDonald and Allen, 1967; Berliner, 1969), from face-to-face to remote feedback situations (Meier, 1969; Doty, 1970), and from viewing a videotape of a whole lesson to replaying sections of it to focus on particular aspects of teacher (Berliner, 1969; Langer, 1971).

Not all research, however, has indicated that the video replay is superior to other forms of feedback provision. Some investigators, for example, have found no significant difference between video feedback and feedback without video in improving teaching performance (Schueller *et al.*, 1962; Doty, 1970; Rousch, 1969; Hoerner, 1971; Clift *et al.*, 1974). For example, Doty (1970) showed that all four of the following feedback conditions produced significant change in the teaching performance of pre-service and in-service teachers, but no treatment was superior to any other in effecting this change: (a) a face-to-face supervisory conference without video feedback; (b) a face-to-face conference with video feedback; (c) condition (b), but incorporating a three-day delay between the microteaching and feedback sessions; and (d) remote supervision via video replay of a microlesson and an audiotape playback of a supervisory critique.

In another study, Olivero (1970) found mixed results concerning the effectiveness of video feedback. As measured by pupil response to the Stanford Teacher Competence Appraisal Guide, microteachers receiving video and verbal feedback showed greater improvement in teaching performance than those receiving verbal feedback only -- yet video feedback was not superior to a further feedback condition in which supervisory conferences were based on live observations of teaching in the classroom setting. The supervisors commented that video feedback facilitated attention to specific teaching behaviours by eliminating the distraction of multiple classroom stimuli, but Olivero concluded that the finding in favour of live observation reflected the elimination by videotape of many relevant as well as distracting stimuli. Consequently, he recommended that "observations should be structured so that focus is directed to the specific behaviours the supervisor desires to observe" (Olivero, 1970: p.12).

Olivero's recommendation suggests that the focus of the video

camera may facilitate or hinder the observing of relevant stimuli for feedback purposes. Unfortunately, empirical studies on the camera focus variable are few in number and tend to be inconclusive or contradictory in their findings. Waimon and Ramseyer (1970), for example, found no significant differences in teaching performance for subjects experiencing supervisory feedback without video support, and three variations of videotape feedback without supervisor support in which the camera focused on the pupils only, the teacher and pupils from the side, and a front view of the teacher only. Nonetheless, these investigators recommended that video feedback in a comprehensive microteaching programme should first enable participants to concentrate on their own teaching behaviour (camera focus on the teacher only), and then on the more demanding task of studying video replays in which the camera focuses on teacher-pupil and pupil-pupil interactions. In contradistinction, after using microteaching to retrain language teachers, Dugas (1967) recommended that the camera should focus predominantly on the pupils in order that teachers might attend closely to the effects of their behaviours.

Despite the availability in recent years of less expensive and more portable videotape equipment, the provision of video feedback for large numbers of microteachers is still a costly exercise (c.f., Clift *et al.*, 1974). It is understandable, therefore, that some research on microteaching has compared the effectiveness of video feedback with that provided by the relatively inexpensive audiotape recorder. In fact, the results of several studies have indicated that audio feedback may be superior to video feedback. For example, in comparing the results of four feedback treatments on the verbal teaching skills and attitude towards microteaching of educational psychology undergraduates, Shiveley *et al.* (1970) found that teaching performance was most affected by a supervisory critique that was based on audio feedback, or on pupil ratings of the teacher using the Stanford Teacher Competence Appraisal Guide. Video replays with supervisory comment appeared to these researchers to be relatively weak as a feedback procedure, although the least effective treatment was a critique based on a supervisor's observation of a 'live' teaching performance (a finding which tends to conflict with that of Olivero discussed above). In attitude towards microteaching, subjects receiving a supervisory critique based on either video or audio feed-

back were more positive in their ratings than subjects in the other feedback group. However, when these subjects were asked to evaluate the potential of microteaching for them as future teachers and as a means of facilitating self-assessment, ratings by the audio group were significantly higher than those in the video group.

In this study, then, the overall results appeared to favour audio rather than video feedback. Nevertheless, Shiveley *et al.* have pointed out that because the dependent variables were strongly verbal in nature, the addition of non-verbal information via the video replay was probably irrelevant. Consideration of these results should also take into account two further points: first, the experimental data were obtained from the application of analysis of covariance to one microteach and one reteach session only; secondly, the experimental results must be weighed against the wide variability in the number of observations across the four treatment groups which was due to an inexplicable rate of attrition by subjects prior to the first teaching session.

P.M. Ward (1970) also found audio feedback to be more effective than video feedback. Ward studied the relative effects on the questioning skills of elementary school teachers of self-evaluation without audio-visual feedback, and self-evaluation aided by self videotapes, self audiotapes, or a combination of self video and model videotapes. The largest mean difference in numbers of probing questions between a pre- and post-test was achieved by subjects in the audio feedback group. Ward concluded that "the necessity to listen intently without visual concentration provides stimulation sufficient to affect the questioning-skill ability of teachers" (P.M. Ward, 1970: pp.93-4); further, that the audiotape recorder was a much underrated technical aid in the provision of in-service training for teachers.

Other investigations have indicated that audio feedback is at least as effective as video feedback. Thus Boone and Stech (1970) concluded from their study of the development of clinical skills in speech pathology that there was no significant difference in the performance of therapists who received feedback in the form of behavioural scores based on either video or audio replays of their microsessions. Similarly, Klingstedt (1970) found no significant difference in ability to use the skill of stimulus variation between groups receiving video or audio replays of microlessons which were

combined with verbal as well as written prompting and cueing by peers and a supervisor. Acheson and Tucker (1971) conducted a micro-teaching programme in which video demonstration was coupled with audio feedback, and compared this treatment with one using videotape for both modelling and feedback purposes. They found no significant difference in ability to ask high order questions between interns assigned to the audio and video treatments.

Nevertheless, the results of the Clift *et al.* study (1974) cited earlier suggest that the effectiveness of audio feedback may be related to entering microteaching with low rather than high ability in handling the teaching skills to be practised. Furthermore, several other studies have revealed that the audio mode is not favoured by those experiencing it. Thus Smith (1969) found no significant difference in teaching performance between teachers who received face-to-face or phone critiques of their microlessons that were based on either video or audio replays, yet supervising teachers and micro-teachers both expressed least satisfaction with audio feedback. Gall *et al.* (1971) reported a similar finding among teachers who were assigned to an audio replay treatment during an in-service course which was designed to improve tutoring skills in mathematics.

Results in the Gall *et al.* study showed that there were no significant differences between the video and audio feedback modes with respect to the number of demonstration techniques used, the amount of practice provided, and performance in diagnostic questioning skills. However, these investigators suggested that, due to a lack of distinctiveness between the two feedback treatments, their equal effectiveness overall was more apparent than real: special advantages could have accrued to teachers receiving audio feedback because they were able to reconstruct visual aspects of their tutoring sessions by referring to the actual worksheets they had used with their pupils. Thus, Gall *et al.* proposed that video feedback may best facilitate the acquisition of certain non-verbal skills which have substantial visual aspect and which are not reproducible via audiotape.

A similar proposal has been made by Hiscox and Van Mondfrans (1972) whose research included two psychomotor and two verbal teaching skills as dependent variables in order to test for interaction effects between these skills and audio or video feedback. As revealed by pupil ratings of teaching performance, microteachers receiving audio feedback were

significantly better at encouraging pupil-initiated questions than those receiving video feedback. However, no significant differences were found between the two media treatments with respect to the other dependent variables. Anticipating a stronger effect for video feedback, the investigators suggested that this was undermined by the interaction of "cosmetic effect" and other factors. Thus, despite indication by their results that audio feedback as an effective substitute for video feedback in the promotion of non-verbal skills, Hiscox and Van Mondfrans recommended that, in any comprehensive microteaching programme, the two media should be alternated: audiotape when the focus is on verbal skills, and videotape for a shift of focus to non-verbal skills.

Supervision and Feedback

Koran (1969) and Olivero (1970) have both recommended that supervisory feedback in microteaching programmes should focus on two or three aspects only of a skill, reinforce appropriate performance of it by the microteacher, and provide discrimination training on the salient cues for its use. Thus these two investigators see the supervisor as having extensive control over the feedback situation.

Some investigators, however, have urged that the prominent place given to the supervisory critique in microteaching should be replaced by an emphasis on self-evaluation. Dugas (1967), for example, has argued that the self-critique is the only means of stimulating real professional growth, while Davis (1971) has contended that self-evaluation should take priority during pre-service education because 'expert' supervision is seldom available to the practising teacher. Other investigators have argued the case for self-evaluation on practical grounds. They have seen self-critiques (possibly supported by pupil and peer feedback) as a way of obviating the complex logistic problems and heavy demands on supervisor time that attend the provision of supervisory conferences for large numbers of microteachers. Consequently, some research has attempted to show experimentally that the 'expert' supervisor is no more effective as a source of feedback than the microteacher himself, the microclass, or fellow microteachers.

Among the earliest studies of this type is one by McDonald and Allen (1967) who compared the effects of self-evaluation and supervisory feedback for helping teaching interns learn how to reinforce

pupil participatory responses. The results of this study indicated that the most effective form of feedback was supervisor verbal reinforcement of all observable instances of the desired behaviour on a video replay of microteaching performance, augmented by the supervisor pointing out salient pupil responses to which positive reinforcement could be attached and suggesting ways of improving the use of reinforcement skills. There were no significant differences between three other feedback treatments which were also based on video replays. These treatments were: (i) independent analysis using general observational guidenotes; (ii) self-evaluation using general guidenotes plus a specific description of reinforcement procedures, a direction to reward pupil participatory responses, and a rating sheet for recording approving and disapproving behaviours; and (iii) the use of general and specific guidenotes plus supervisor verbal reinforcement of instances of the desired behaviour. While the findings in this experiment suggested the need for focused and extensive supervisor control of the feedback process, McDonald and Allen acknowledged the costliness of this approach and indicated that it did not meet with the approval of all microteachers (perhaps because of the interaction of trainee and supervisor personal characteristics). In addition, consideration of the findings in this study need to take into account a possible difference in the time that was allocated to the self-evaluation and supervisory feedback conditions, as well as the fact that only one verbal skill was involved.

However, the results from several other studies have indicated that the self-critique is less effective than the supervisory critique in producing change in teacher behaviour. Fuller *et al.* (1966), for example, found that a combination of audiotape replays of teaching with a face-to-face supervisory conference resulted in significantly less discrepancy between self-ratings and observer ratings of behaviour change than occurred with feedback consisting of an audio replay only. Similarly, audiotape feedback combined with a listening guide and a non-directive supervisory conference was found by Morse *et al.* (1970) to produce significantly greater increase in beginning teachers' use of refocusing skills than did audio feedback (with or without a listening guide), or a no-feedback condition.

Although the foregoing studies appear to suggest that effective feedback is dependent on the contribution of an 'expert' supervisor,

other investigations have reached different conclusions. For example, Jensen (1968) found no significant change in general teaching competence by in-service teachers who were asked to self-evaluate their teaching on the basis of performance goals set by themselves prior to teaching and videotaping. Apparently, discrepancy or match between planned goals and teaching actualities was highlighted during video self-confrontation, and served as the training cues that would normally be provided by a supervisor.

Other studies have made direct comparisons of self- and supervisory critiques and have reported no significant differences between the two in effect on teaching performance (Ryan, 1966; Adair and Kyle, 1969; Johnston, 1969; Cameron and Cotrell, 1970; Doty, 1970; Harrington, 1970; Waimon and Ramsayer, 1970). It should be noted, however, that the majority of these studies have been concerned with in-service rather than pre-service training.

Yet another group of investigators has found that critiques from fellow microteachers and pupils in the microclass can be effective sources of feedback. In a previously cited study by Acheson (1964), it was found that pupil feedback was superior to supervisory feedback without video replay in bringing about a decrease in the use of monologues by secondary school teaching interns. Again, Belt (1967) reported that student teachers reacted positively to comments on their teaching by their high school pupils and fellow microteachers who joined a supervisor during critique sessions.

In a study involving subjects across three levels of teaching experience, Tuckman and Oliver (1968) compared the relative effectiveness of a no-feedback condition with feedback from pupils only, from a supervisor only, and from both pupils and a supervisor. Feedback was based on pupil response to a Student Opinion Questionnaire, this instrument also being used to measure change in teaching performance over a 12-week interval. A two-way analysis of variance for total change score revealed a main effect for pupil feedback only with no significant interaction effects, and no significant differences between results from the pupil feedback treatment and pupil feedback combined with supervisor feedback. Thus, adding supervisory feedback to pupil feedback produced no more behavioural change. Moreover, when used alone, supervisory feedback actually shifted teachers in a direction opposite to the feedback as opposed to the no-feedback condition.

Considering years of teaching experience in relation to the four feedback conditions, pupil feedback was better received by less experienced teachers while experienced teachers were more receptive to supervisory feedback.

Although Harrington (1970) found self-critiques and those provided by pupils, microteacher peers or a supervisor to be equally effective, he observed a significant negative attitude among microteachers towards peer supervision. This finding could be attributable to the nature of the sample used: it consisted of in-service technical education teachers who may not have had sufficient background knowledge on the teaching process to provide appropriate comments on teaching behaviour. An alternative explanation might be that the subjects were strangers to each other and were not carefully prepared on how to conduct critique sessions along objective, behaviourally oriented lines. D.A. Young (1970), for example, appears to have provided the latter kind of preparation in a microteaching programme for participants who were already known to each other. She observed no negative reactions towards peer supervision. Furthermore, feedback in the form of peer critiques was at least as effective as supervisory critiques in helping microteachers increase their use of orientation skills as well as some verbal and non-verbal skills.

Positive attitudes towards peer supervision have been reported also by Guelcher *et al.* (1970) and McIntyre (1972). At the University of Chicago, Guelcher *et al.* have modified the Stanford model of microteaching in order to put the supervision process more in the hands of student microteachers themselves. The programme begins with microteaching of peers as a means of learning how to supervise one's fellows in the microteaching of school pupils which follows.

In the teacher education programme at Stirling University, McIntyre not only examined the relative effects of peer and supervisory critiques on the acquisition of teaching skills, but also their relative potential for helping student teachers improve their ability to observe, analyse and evaluate teaching. He felt that the 'expert analyst' rôle played by microteaching supervisors could be taken over by microteachers themselves working in small groups using a simple observation instrument. In these circumstances, it was envisaged that the supervisor's rôle would be to provide "a second opinion, a testing ground for self-criticism or suggested changes, or reassurance

rather than expert analysis ..." (McIntyre, 1972: p.2).

McIntyre's study revealed that there were no significant differences in performance on thirteen criterion verbal skills between student teachers who worked with a supervisor and those who received feedback from their microteacher peers. In addition, with reference to evaluative behaviour when observing teaching, these same student teacher groups showed significant difference in one regard only: those working with a college supervisor suggested more alternative teaching behaviours to a microteacher. Apart from this, the supervisory or peer critique made no difference over fifteen types of evaluative statements which covered constructive and emotionally supportive ways of helping a teacher in such general areas as motivating, explaining, questioning and reacting skills.

On the basis of the studies reviewed above, then, the evidence is largely conflicting with regard to who is the best person to provide feedback to microteachers. Certainly, there is no clear-cut evidence that the presence of an 'expert' supervisor is always necessary. Several reasons may be advanced for this apparent ineffectiveness of 'expert' guidance or supervision:

(i) A tendency in some studies to use unfocused feedback.
(ii) The interaction of modelling and feedback effects.
(iii) Insufficient attention being paid to the type of feedback information provided.

Focused and unfocused feedback. As cited earlier in this review, Koran (1969) and Olivero (1970) have recommended that supervisory feedback should be focused and selective. Support for this recommendation has been provided by Rezler and Anderson (1971) who found that stopping a video replay at selected points to facilitate cueing and reinforcement of appropriate behaviours (focused review) was significantly superior to making general supervisory comments after playing a tape right through (unfocused review).

In some studies, the apparent ineffectiveness of supervision may be due to the use of unfocused feedback. For example, Waimon and Ramseyer (1970) found that student teachers who received supervisory feedback based on live observation did not differ significantly in their self-evaluating ability using the Stanford Teacher Competence

Appraisal Guide from those who used self-critiques based on video replays. The investigators observed that this finding may have reflected supervisor tendency to discuss "diverse and often unimportant matters" and they suggested that "one of the major lessons to be learnt by supervisors from microteaching research is the need to concentrate supervision on one component task of teaching at a time and see to it that this component is fully achieved before moving onto the next" (Waimon and Ramseyer, 1970: p.95).

In the Waimon and Ramseyer study, supervisors did not have the support of the video replay to help them achieve focused feedback. However, even where the video facility is available, Joyce (1967) has noted that supervisors often talk all the time the video recording is being played back, and tend to discuss hypothetical examples of teaching rather than maintain focus on the actual samples of teaching presented on the video monitor.

Modelling and feedback. Ineffectiveness for supervisory feedback in the microteaching research may also relate to insufficient consideration being given to its interaction with modelling procedures. In McDonald and Allen's (1967) study, this interaction possibility was examined by comparing the effects of different combinations of modelling and feedback treatments on the use of probing questions by pre-service teachers. The results showed that the optimal combination of modelling and feedback treatments was symbolic plus visual-perceptual modelling coupled further with supervisor prompting and reinforcement. Unfortunately, the research design in this study did not permit a comprehensive analysis of the interaction possibilities for different kinds of modelling and feedback. However, the investigators did find that, in relation to visual-perceptual modelling, the addition of supervisory feedback in the form of reinforcement and discrimination training during the video replay of a lesson did not significantly improve teaching performance.

This result suggests that the reinforcing and motivational properties of supervisory feedback are not as influential as the informational type of feedback available to a microteacher from a comparison of his teaching performance on a video replay with that of a previously studied model. It seems that when a microteacher knows and accepts the desirability of teaching behaviours expected of him, his attention is likely to be directed to those behaviours in the video

replay which are either dissonant with, or match, these expectancies. Because cognitive dissonance is a motivating force in human behaviour which tends to lead to its own reduction (Festinger, 1957), the micro-teacher is likely to attempt subsequently to more closely approximate the desired behaviours presented by a model. In Annett's terms (Annett, 1969), the microteacher is provided with proactive feedback: knowledge of results about his immediate teaching performance, and information to guide his selection of behaviours in subsequent micro-teaching sessions.

Several studies have lent support to this kind of analysis. For example, Salamon and McDonald (1970) found that, in the absence of modelled standards of performance and guidance as to what should be attended to during self-viewing, the predispositions of teaching interns about the quality of their teaching tended to determine what they observed on the video monitor, how they rated their performance, and any attitudinal shifts they made. Those who were dissatisfied with their teaching prior to self-viewing were disposed towards de-valuing the institution of "teacher education", maintaining their low professional self-image, and noticing mainly physical appearance cues on the screen. Conversely, interns having more positive regard for themselves prior to self-viewing tended to upgrade their image and to notice mainly video cues that were related to teaching behaviour. Although this experiment did not include a control group which could have received guidance in self-viewing, Salamon and McDonald stated that a reasonable conclusion from the study is that self-viewing of a video replay of teaching performance is unlikely to lead to any desirable attitudinal and behavioural changes unless it serves as informational feedback about the degree of departure from a desired performance.

The significant rôle that informational feedback may play in microteaching is demonstrated further in studies by Claus (1969), Borg *et al.* (1968, 1969) and Resnick and Kiss (1970). Claus compared the effects on the use of high order questions by pre-service teachers of the presence or absence of supervisor cueing during the presentation of a videotaped model, and during video replays of microteaching performance. Her results indicated that, with cued perceptual modelling, the addition of cued replays did not produce significantly better performance than did self-viewing alone. Similarly, the use by

Borg *et al.* in their Minicourses of highly structured and cued models, supplemented by detailed self-evaluation guides, appears to have obviated the need for supervisory feedback. Resnick and Kiss (1970) also have demonstrated the effectiveness of modelling with discrimination training over supervisory feedback.

Collectively, these studies seem to indicate that supervisor cueing of a teaching model probably has more effect on subsequent teaching performance than does supervisory feedback provision and that, apart from organisational oversight, there is no need for the presence of a supervisor during the microteaching learning sequence. In McIntyre's opinion, however, this standpoint is too simple (McIntyre, 1972). He concurred with McKnight (1971) who suggested that supervisory feedback may demonstrate its effect, not during the initial stages of the acquisition of skills, but rather during the period of regression and disintegration which sometimes accompanies subsequent attempts to refine teaching behaviours and adjust them to the demands of different subject matter, teaching objectives and pupil groups. Thus McKnight has seen a need for microteaching research that tests the efficacy of supervisory feedback during this second-phase learning.

Informational-type feedback. The studies just reviewed have suggested that a supervisor's reinforcing and motivational feedback is not as effective as the informational feedback which results from a microteacher recognising points of consonance and dissonance between his own teaching performance and that presented by a model as a desirable standard. However, as discussed in the first section of this chapter, other studies have shown that discrimination training based on teaching samples rather than teaching models, can sensitise teachers to different teaching skills and produce change in subsequent teaching behaviour (Wagner, 1973; Freyberg *et al.*, 1974). Moreover, it appears that some modelling in the microteaching process includes a strong cognitive discrimination learning component (see, for example, Borg *et al.*, 1968, 1969; Borg, 1970).

The possibility arises, therefore, that effective informational-type feedback may also result when a microteacher: (i) is sensitised to certain teaching skills through discrimination learning activities; (ii) determines his own teaching intentions or 'standards' for the use of these skills; and (iii) evaluates a video or audiotape replay

of his performance by comparing these intentions with the teaching actualities. This appears to have been the case in a previously cited study by Jensen (1968). The in-service subjects in Jensen's study made significant changes in general teaching competence as the result of independently viewing video replays of their teaching in order to identify discrepancies and points of match between their intentions and their performance.

Interest in the relationship between informational-type feedback and teaching intentions has prompted some investigators to explore the use of interaction analysis systems as behaviour modifiers in the microteaching setting. Most research in this direction has used Flanders Interaction Analysis (FIAC) or some modification of it. Johnston (1969) found that self-supervision using FIAC resulted in students using significantly more indirect teaching behaviours (the programme objective) and obtaining higher scores on the Minnesota Teacher Attitude Inventory. A supervisory critique based on live observation did not appear to be as effective as the informational type of feedback. Again, when Wragg (1971) compared the effects on teaching behaviour of either video of FIAC feedback alone, and a combination of these, he found that only the combination treatment produced significant behavioural changes between a teach and a reteach session. In another study, Hough *et al.* (1969) examined the effects of formally training some student teachers in FIAC, and asking others to generate their own informal analysis systems. A comparison of performance during microteaching showed that the FIAC group was generally more indirect in teaching style, and that this difference persisted in the next year's student teaching programme when a follow-up study was conducted using representative samples from the original treatment groups.

The use of various forms of skills analysis record as feedback devices appears to be increasing among researchers and microteaching practitioners. Although the sophistication level of some of these instruments requires the services of trained observers or supervisors, others are readily managed by microteachers themselves, microteacher peers, or even pupils in the microclass. Some of these instruments have an evaluative orientation (see, for example, Allen and Ryan, 1969; T.B. Gregory, 1972). Others, however, provide a descriptive profile of teaching behaviour simply to facilitate comparison between teaching

intentions and performance actualities (see, for example, Amidon and Hough, 1967; Amidon *et al.*, 1969; P.M. Allen *et al.*, 1970; Flanders, 1970; Thew, 1973).

A study by Thew (1973) is especially significant in this trend. In contrast to the Stanford University emphasis on training teachers in somewhat isolated and specific skills via modelling and reinforcement, Thew extended the microteaching format to a more integrative view of teaching in which personal decision-making is of primary importance. Her objective was to sensitise student teachers to a broad repertoire of organisational skills for setting up various kinds of learning environments in the classroom. These environments reflected different social organisations, each with differing potential for inter-personal and cognitive interactions that ranged along a teacher-centred to pupil-centred continuum. Specifically, Thew compared the effects of three treatments on teacher flexibility in rôle enactments as measured by her Social Organisation Category System (SOCS): (i) A human relations workshop with some experience in SOCS analysis; (ii) a human relations workshop combined with microteaching that included SOCS feedback; and (iii) a human relations workshop combined with microteaching having no SOCS feedback. The results for the major criterion variable SOCS showed that the combined workshop-microteaching-SOCS treatment was significantly superior to both the other treatments, between which there was no significant difference.

Although a trained observer provided the interaction analysis data in the Thew study, student teacher receptivity was apparently related to the independence that was encouraged in the use of this feedback information. Some research has reported student defensiveness when interaction analysis data is imposed by a supervisor as an assessment device (Amidon and Powell, 1966; Traill, 1971; Brusling and Tingsell, 1973). Apparently, student teachers have a strong preference for self-evaluating their teaching, having opportunities to practise and share their experiences with peers, and using the supervisor 'expert' as a stand-by source of guidance when they feel a need for his services (Johnson and Knaupp, 1970; McIntyre, 1972; Foster *et al.*, 1973; Levis *et al.*, 1973).

It appears, therefore, that when feedback is too supervisor-

centred, its benefits may be lost. For example, in a pilot study on microteaching at Sydney Teachers College (Foster *et al.*, 1973), student teachers were willing to accept supervisory comments on their teaching but also "demonstrated their desire to determine independently how they should modify and develop their teaching style." (p.117). The emphasis on group discussion rather than supervisory conferences in some microteaching programmes seems to reflect this student teacher preference for greater autonomy in the planning and evaluation of their teaching (see, for example, New University of Ulster: Brown, 1971; University of Liverpool: Beattie and Teather, 1972).

One implication of all of the studies discussed in this section is that the type of feedback available to a microteacher might be the crucial factor in determining the effectiveness of the self-evaluation process and a microteacher's willingness to change his teaching behaviour. Thus, it may be more important for current research to assess the relative merits of different kinds of informational feedback (e.g., from various interaction analysis systems and other forms of behavioural coding) than to attempt to identify who are the best persons to reinforce or to rate a microteaching performance.

Summary and Comment

More research has been conducted on the feedback phase in microteaching than on any other aspect, and this is an indication of the importance attached to this process in the acquisition and refinement of teaching skills.

Prima facie, video feedback in microteaching would seem to have greater potential than audio feedback and, in the main, this appears to be borne out by the attitudes of microteachers and their supervisors (see, for example, Smith, 1969; Gall *et al.*, 1971). In addition, the audio-visual mode has the advantage of being able to supply information on both the verbal and non-verbal aspects of teaching behaviour. Generally speaking, however, the research findings on video and audio feedback have been equivocal (Smith, 1969; Boone and Stech, 1970; Klingstedt, 1970; Acheson and Tucker, 1971; Gall *et al.*, 1971). One study has indicated that the acquisition of verbal teaching skills may be facilitated better by

audio feedback because it encourages intent listening that is free from visual distraction (P.M. Ward, 1970). But there is a paucity of research which has tested specifically for interaction effects between the two feedback media and verbal or non-verbal skills (Gall *et al.*, 1971; Hiscox and Van Mondfrans, 1972). While most microteaching practitioners use video feedback, it is possible that the less costly audiotape mode could often be used to equal or better effect. At present, however, there is insufficient empirical evidence to support this proposal.

Some research has indicated that supervisory conferences based on video replays of microteaching performance are more effective than supervisory critiques based on live observation of teaching (Acheson, 1964; Cooper, 1967; Wood and Hedley, 1968; Berliner, 1969). By and large, however, the empirical evidence appears to contradict the assumption made in the Stanford model of microteaching that reinforcement and cueing of appropriate teaching behaviour by an 'expert' supervisor is the best way to transmit feedback to microteachers. Findings are equivocal or inconsistent in the seventeen studies reviewed which have examined the relative effectiveness of self-evaluation, peer feedback, pupil feedback and the supervisory critique. Peer feedback appears to have high receptivity, especially when microteaching participants are well known to each other and are carefully prepared on how to implement focused and objective feedback (Belt, 1967; D.A. Young, 1970; Guelcher *et al.*, 1970; McIntyre, 1972). Again, a number of studies have shown self-evaluation to be at least as effective as the supervisory critique, albeit that most of these studies refer to in-service and not to pre-service teachers (Ryan, 1966; Adair and Kyle, 1969; Johnston, 1969; Cameron and Cotrell, 1970; Doty, 1970; Harrington, 1970; Waimon and Ramsayer, 1970).

While it is reasonable to assume that inexperienced student teachers may require the help of a supervisory critique (c.f., Griffiths, 1972), resolution of the problem of <u>who</u> is the best person to transmit feedback to a microteacher may really be the problem of identifying the most effective <u>type</u> of feedback. There appear to be two possibilities here. First, research on modelling and feedback has suggested that feedback is especially influential as a behaviour modifier when it focuses on discrepancies between a microteacher's

performance and desired behaviours presented in a teaching model (McDonald and Allen, 1967; Borg *et al.*, 1968, 1969; Claus, 1969; Olivero, 1970; Salamon and McDonald, 1970; Resnick and Kiss, 1970). The cognitive dissonance that is aroused seems to be instrumental in subsequent teaching being aimed at establishing greater consonance between the 'ideal' and the 'actual'. This informational or proactive feedback appears to be more effective than supervisor reinforcement, cue discrimination training or evaluative comments.

Secondly, however, some recent research has indicated that student teachers react negatively to the supervisor-centredness of critique sessions. They prefer to establish their own teaching intentions, discuss their teaching performance with peers vis-à-vis these intentions, and make independent decisions as to how they should modify and develop their teaching styles (Johnson and Knaupp, 1970; Traill, 1971; Brusling and Tingsell, 1973; Foster *et al.*, 1973; Levis *et al.*, 1973; Freyberg *et al.*, 1974). In this context, it appears that informational feedback from interaction analysis instruments has a special rôle to play.

Conclusions

Since its inception at Stanford University in the early 1960s, microteaching has prompted more research into practice teaching then has ever occurred before. Nevertheless, far from leading to discovery of the most effective way of implementing this training procedure, the burgeoning amount of research has clouded the picture for microteaching practitioners. As the review of the research literature in this chapter has shown, there is a large number and great variety of factors which could be considered as providing a source of variance in teaching performance in any experimental design or developmental programme examining the viability of the micro-teaching process.

Concerning the sensitisation model of microteaching proposed in Chapter 2, the literature gives even less guidance because this approach has received hardly any attention either from researchers or from teacher educators. However, some of the research findings on Stanford-type programmes, as well as attempts more lately by a few

researchers to break away from the component skills approach, appear to lend support to learning principles inherent in a sensitisation model. Thus, summary and comment sections throughout the present review have suggested:

1. That use of an appropriate interaction analysis system to discriminate, code and analyse teaching strategies and skills in a variety of teaching samples may affect subsequent teaching performance as much as does observational learning and imitative practice of a teacher modelling a single skill.

2. That even without practice opportunities, sensitisation experiences such as those mentioned above may have a substantial effect on subsequent teaching performance.

3. That when student teachers observe and analyse the teaching performance of fellow microteachers with an appropriate interaction analysis system and provide them with objective feedback on their teaching, this may affect the student teachers' own teaching performances as much as does actual microteaching practice.

4. That self-analysis and self-evaluation of teaching based on objective feedback from fellow microteachers may have as much effect on subsequent teaching performance as a supervisory critique session involving positive reinforcement for appropriate use of a teaching skill, discrimination training, and direct advice on how to improve teaching competence.

These observations, together with concerns expressed in the Introduction and problems in the Stanford model of microteaching discussed in Chapter 2, account for the emphasis in the present investigation on microteaching as a sensitisation experience.

In addition, however, research on microteaching has yet to provide clear guidelines on ways of overcoming the logistic, resource and time involvement problems that appear to attend any large-scale implementation of microteaching in a teacher education institution. To the teacher educator, solutions to practical problems such as these are likely to be of as much import as choosing to adopt one model of microteaching rather than another -- and may even determine whether the microteaching procedure will be used at all. Thus, in

the context of a sensitisation approach to microteaching, it was decided in the present study to investigate the relative effects on teaching performance of:

1. Microteaching student teacher peers versus microteaching of school children.

2. Using the cheaper and more readily available audiotape medium versus videotape to support both analysis and feedback activities during microteaching.

3. Practising some teaching skills only and acquiring others "vicariously" through observation of their use by fellow microteachers.

The nature of the microteaching programme that was used in the study, and how it differs from programmes based on the Stanford model, is discussed in the chapter which follows.

CHAPTER 4

THE MICROTEACHING PROGRAMME

OUTLINE: The objective of the microteaching programme is stated. An account is then given of the microteaching procedures that were used in the study, pointing out features in the basic format of Analysis/Practice/Feedback that were at variance with the Stanford model of microteaching.

Consonant with the conceptual model presented in Chapter 2, the microteaching programme in the present study emphasised flexible handling of alternative ways of using a variety of teaching skills in discussion lessons with a small group of pupils. The objective was not merely for student teachers to acquire control of alternatives in a mechanical way, but for them to begin to become sensitised to cues in the teaching environment which might signal the need to modify their teaching behaviour.

To help students achieve this objective, discussion skills in the microteaching curriculum were organised as interrelated clusters over five laboratories so that an accumulating repertoire became available for practice purposes (FIGURE 4.1: p.219). Students were encouraged to experiment with strategies that integrated new skills with those in previous laboratories, but always using these skills in ways that contributed to the objectives for their microlessons rather than artificially "forcing" their application. As a result, a holistic and pedagogically purposeful view of the teaching process was maintained.

Procedures

The microteaching programme consisted of an introductory session and five laboratory experiences, the latter requiring participants to attend eighteen one-and-a-half hour sessions altogether. Except for the fourth laboratory which focused entirely on learning how to use

the SQUAIES Interaction Analysis System which will be described later, each laboratory followed the same basic format of Analysis/Practice/Feedback. FIGURES 4.2 to 4.6 (pp.220-223) provide information on:

(i) the organisational schedule for the microteaching programme;
(ii) the basic microteaching format;
(iii) the time allocations for activities within the microteaching format;
(iv) the organisational arrangements made to accommodate three microteaching sessions within a practice laboratory;
(v) the location and set-up of the microteaching stations; and
(vi) the video and audiotape technology that was used.

Programme Components

The concern of the microteaching programme with sensitive control of teaching repertoire gave rise to particular emphases in the introductory session and the analysis, practice and feedback phases of each laboratory that were different from the behaviouristic orientation of the classical Stanford model.

1. The Introductory Session

Central to this session was discussion of the model referred to above in which the sensitised teacher is portrayed as being very like the professional golfer who orchestrates an extensive repertoire of skills as he perceives guiding cues in the golf setting (FIGURE 4.7: p.224). The comparison of this model with the more complex group of factors operating in teaching highlighted the difficulty in identifying a universally effective teaching approach, and was intended to lend support to the emphasis on person exploration in the microteaching programme. Discussion was then followed by a series of informal and humorous activities which, depending on the microteaching treatment involved, were videotaped or audiotaped for immediate replay after which participants were invited to operate the equipment. In part, these activities were designed to help "decosmetise" participants concerning preoccupation with their personal mannerisms and visual (or auditory) images. More importantly,

however, it was hoped to offset anxieties that some may have felt about the self-confrontation experience during replay of their future microlessons (c.f., Baker, 1970; Fuller and Manning, 1973).

2. The Analysis Phase

The initial phase in each microteaching laboratory occupied a single one-and-a-half hour session, and concentrated on discussion and analysis of a cluster of interrelated skills for which the stimulus materials were: (i) a skills description in the laboratory manual; (ii) two presentations of teaching samples; (iii) a transcript of the first teaching sample; and (iv) a set of exercises. Depending on the microteaching treatment involved, the two teaching samples were presented on videotape or audiotape, with the first sample being contingently focused through visual labelling of the salient cue to which a subsequent teaching skill was attached (FIGURE 4.8: p.225). The second teaching sample was not contingently focused or cued.

It should be noted that the teaching samples presented in this session were not training protocols in which relatively isolated skills were modelled. The two teachers providing the samples had not been asked, for example, to highlight a skill like the probing question by producing a high emission rate, as Orme (1966) requested of his models. Rather, the teachers had been asked to plan and teach a 10-12 minute discussion lesson related to the cluster of skills for a laboratory in which (i) not all skills and patterns for their use had necessarily to be represented; (ii) skills from previous laboratories could be used; and (iii) skills were to be used in ways that the teachers thought appropriate for the teaching objectives they happened to elect (see Appendix C.2: p. 410 for the directions given to teachers).

The purpose of both teaching samples was to help microteaching participants discriminate the behavioural aspects of skills as these happened to be used, and not necessarily as these ought to be used. This initial sensitisation was reinforced by coding activities, and supplemented by discussion in which participants were encouraged to suggest alternative ways for using the skills, the aim being to widen their repertoire knowledge prior to their own microlessons. In short, analysis rather than imitation learning was the emphasis. Although not always complete lessons, the teaching samples were of sufficient

duration to extend this analysis to the relationship between patterns of skill use and overall teaching strategy. This relationship is not so readily discernible in the short training protocols that are often presented in microteaching programmes following the Stanford model.

3. The Practice Phase

Consonant with the sensitisation model underlying the microteaching programme, participants were free to experiment with skills as they saw them contributing to their teaching objectives within the constraints of the 5-10 minute period allowed for microteaching. They were not required to reach some predetermined criterion performance level with any particular skill. Nor was any suggestion made by supervisors, or in the laboratory manuals, that high frequency of use for a skill denoted effective learning by the microteacher -- or, for that matter, effective teaching.

While the cumulative and interrelated nature of the skills clusters over all laboratories gradually broadened opportunity for such experimentation, this was not exercised so much through direct practice as it was through observation and coding-analysis of the variety of teaching approaches exhibited by group members. To illustrate: in microteaching treatment groups involving the teaching of children, each microteacher in a group of six members taught on five occasions only during the whole programme but had twenty-five opportunities to provide feedback data for fellow microteachers and to participate in feedback discussion sessions. A schedule was designed for this feedback activity so that each participant had occasion, over the whole programme, to concentrate at various times on all teacher and pupil behaviours included in the curriculum (see Appendix D: p.413).

In the case of treatment groups participating in simulated microteaching of their peers, the participant-observer rôle assumed by each group member meant even greater opportunities for analysis experience: in addition to five microteaching sessions, they had twenty-five experiences as a pupil during which, as reported later by participants, they tended to consider the microteacher's handling of skills while teaching proceeded; and twenty-five observer-coder and feedback-giving experiences.

To summarise, the sensitisation experience was broad in nature

and rested more on observation and analysis than on direct practice. It reflected the suggestion from some research (e.g., Borg *et al.*, 1969; Goldthwaite, 1969) that practice is not necessarily the most significant factor in a microteaching programme. This suggestion, combined with the inconclusive nature of the research findings on the need for a reteach session, led to the elimination of reteaching opportunities from the programme except for the third teaching laboratory, where the range of middle and high order questioning skill possibilities could not be adequately explored on the basis of one microlesson only.

4. The Feedback Phase

The feedback sessions following microteaching deliberately gave no opportunity for the group supervisor and microteacher observers to make overt value judgments, nor to complete rating scales, or to positively reinforce those teaching behaviours that they believed were the 'correct' ones to use. The emphasis in all feedback sessions was on self-analysis and self-evaluation. Depending on the micro-teaching treatment involved, primary feedback came from a videotape or audiotape replay of a microlesson during which the microteacher was free to make private comparisons between his teaching intentions and teaching actualities. At the same time, group members observing the replay assumed responsibility for collecting secondary feedback data on the strategy and teaching skills used by the microteacher. In early laboratories, secondary data consisted of minute-by-minute frequency counts of the use of particular skills. While this provided a crude estimate of sequential patterns in teacher-pupil behaviour, a more accurate and graphic picture became available during the final laboratory when microlessons were coded and analysed with the SQUAIES Interaction Analysis Coding System (see Appendices E.1 and E.2: pp.416-420 for samples of feedback data).

In the feedback situation, the microteacher was first of all invited by the supervisor to analyse and comment upon his lesson using the information displayed for him by group members. The latter then pointed out patterns in the data and, on the basis of these and a guidesheet, asked questions to encourage the microteacher in further self-analysis. Because the secondary feedback data were the main focus of discussion, analysis could proceed in a relatively impersonal manner and was consequently less threatening to the microteacher's

self-esteem than would have likely been the case had direct criticism been used.

This non-threatening atmosphere was also aided by deliberately avoiding reference to any ideal model of effective teaching as a yardstick of success or failure. Emphasis was on objectivity, clinical analysis and the avoidance of value-judgments. In this setting, responsibility for supervision was effectively in the hands of group members themselves who, by feeding objective information to a microteacher, were actually enriching their own sensitisation experience. The supervisor's rôle was essentially a neutral one: if a value-judgment was made by a member of the group, he asked the person making it to reframe his statement in objective terms. This neutral rôle was in direct contrast to that recommended for micro-teaching supervisors by, for example, Koran (1969) and Olivero (1970), whose more behaviouristic orientation disposed them towards having the supervisor positively reinforce features in a microlesson that he judged to be well implemented by a "trainee".

Further details of the instructional materials used in the microteaching laboratories are available from the author.

CHAPTER 5

RESEARCH QUESTIONS, EXPERIMENTAL VARIABLES AND HYPOTHESES

OUTLINE: The specific research questions which arose from concerns expressed earlier, together with research directions suggested by a review of the literature on microteaching, are first listed. An outline is then given of the independent variables selected for the study, followed by operational definitions of the dependent variables. The chapter concludes with a statement of the four experimental hypotheses that were tested.

Research Questions

As a result of concerns expressed in Chapters 1 and 2, together with findings from a review of the microteaching literature, the present study was designed to clarify the following research questions concerning student teachers' questioning skills and talk patterns in small group discussion lessons:

1. To what extent is teaching behaviour affected by different kinds of teaching practice opportunity such as microteaching, observation and analysis of teaching, and regular coursework in professional studies?

2. To what extent is teaching behaviour affected by teaching practice opportunities, such as microteaching and observation-analysis of teaching, when these programmes make use of different kinds of media (videotape or audiotape)?

3. In microteaching, does it make any difference to teaching performance if one practises with student peers as pupils or with school children?

4. In microteaching, does it make any difference to teaching performance if one practises some types of questions only, but has opportunity to observe other types being practised

by fellow student teachers?

5. In microteaching, do different pupil, media and question level factors interact so that they jointly affect a teaching performance in some ways?

6. What are the attitudes of student teachers towards microteaching as a learning experience?

7. What are the attitudes of student teachers towards observation and analysis of teaching as a learning experience?

Independent Variables

In attempting to answer the research questions listed above, three major independent variables were selected to be manipulated experimentally in the present study. They consisted of three variations in teaching practice opportunity in a teachers college setting:

1. A sensitisation experience in microteaching.

2. A sensitisation experience in observation and analysis of teaching which gave no opportunities for teaching practice.

3. A no-treatment condition which consisted of normal course-work in professional studies, but gave no opportunities for teaching practice.

Further treatment conditions operating in the microteaching and observation-analysis programmes were:

In the microteaching programme

(a) Two variations in composition of the pupil group:
   1. Microteaching five Standard 3/4 primary school children.
   2. Simulated microteaching of five microteacher peers.

(b) Two variations in the media used to present teaching samples for analysis purposes, and for replaying microlessons as a basis for feedback:
   1. Use of video and audio recordings (videotape).
   2. Use of audio recordings only (audiotape).

(c) Two variations in the kind of initial question practised:

1. Use of middle order questions.
2. Use of high order questions.

In the observation-analysis programme

Two variations in the media used to present teaching samples for analysis purposes:

1. Use of videotape samples.
2. Use of audiotape samples.

In addition to the factors above in microteaching that were systematically varied, a number of others were kept constant across microteaching treatments. e.g., naturalistic, cued teaching samples accompanied by lesson transcripts and skills descriptions; the time interval between analysis activities and microteaching sessions; size of the microclass; the duration of microlessons; the use of immediate feedback; and dispensing almost entirely with the reteach session. The adoption of these constants represents an attempt to exercise as much experimental control as possible in the research design rather than being a reflection of the current state of knowledge in microteaching. As indicated in the literature review in Chapter 3, microteaching research is no more conclusive concerning these variables than it is regarding those chosen for the present experimental investigation.

Dependent Variables

The major dependent variables selected for examination in the present study were:

1. Performance in selected questioning skills and the occurrence of selected teacher-pupil talk patterns in the small group discussion lesson situation.
2. Attitudes towards microteaching and towards an observation-analysis programme.

Questioning Skills and Teacher-Pupil Talk Patterns

It is obviously important to judge the effectiveness of a teaching procedure by the extent to which it achieves its main

objectives, and not some peripheral ones. Accordingly, decisions regarding the dependent variables in the study were made having regard to the overall goals of the microteaching programme. These goals were also those incorporated in the observation-analysis programme to make it an equally-favoured alternative. The variables were considered within the following framework.

Context

In devising the skills curriculum for the microteaching and observation-analysis programmes, teacher-pupil interaction in the discussion lesson was viewed as a kind of "language game" in which the participants make various verbal moves (Bellack *et al.*, 1966). These moves could be classified in terms which indicated how the teacher and pupils relate to each other by: (i) making statements that set the context for discussion; (ii) asking questions; (iii) attempting to provide answers; and (iv) commenting on previous statements. Thus, following Bellack *et al.*, verbal moves were regarded as serving one of four types of pedagogical function: structuring, soliciting, responding or reacting. In addition, however, verbal moves were viewed as belonging to units called episodes, an episode being all the teacher and pupil verbal moves which relate to one sub-topic or substantive focus in a discussion lesson (Nuthall and Church, 1973).

This framework permitted a wide repertoire of cognitive and affective teaching skills of a verbal kind to be included in the curriculum for microteaching and observation-analysis, and also accommodated the inclusion of several non-verbal skills. The repertoire of skills is presented in FIGURE 4.1 (p.219). It was selected from: (i) a modification by Nuthall and Church (1973) to Bellack *et al.*'s behavioural model for discussion-type lessons; (ii) the Far West Laboratory's Minicourse I (Borg, 1970); (iii) the investigator's observations of cooperating teachers who were rated highly by the Hamilton Teachers College; and (iv) such evidence as there is from educational research demonstrating a positive correlation between teacher behaviours and pupil achievement (Rosenshine, 1971; Gall, 1973; Heath and Nielson, 1973; Dunkin and Biddle, 1974).

Although the sensitisation experience in microteaching and

observation-analysis referred to a wide variety of teaching skills, most emphasis was placed on the teacher's use of cognitive questions and the various teacher-pupil talk patterns that these might generate. This emphasis reflected the cognitive nature of much of the school curriculum, as well as student difficulties with cognitive questioning as evidenced by the research literature (see, for example, Rosenshine, 1971; Dunkin and Biddle, 1974), and by the investigator's observations when supervising school-practice.

Within discussion lesson episodes, special attention was given to two types of cognitive questions:

1. The teacher's initial questions which introduce the substantive focus for each episode.

2. The teacher's sustaining questions which follow up on the first response to an initial question in an episode by redirecting it to other pupils, or which ask pupils to clarify, extend, critically examine, or refocus their responses.

A sensitive teacher usually exercises flexible control over these two types of questions in accord with his ongoing evaluation of the quality of pupil responses as these relate to his overall teaching objectives. As such, the amount, rate and level of the teacher's cognitive questioning tends to vary in pattern within and across discussion episodes. Concomitantly, this variation tends to affect the nature of teacher-pupil talk patterns.

Specifically, the sensitisation experience in both the micro-teaching and observation-analysis programmes in the present study focused on three aspects of the teacher's cognitively-directed questions:

1. The Control Function of Teacher Questions. The asking of a cognitive question by the teacher carries with it an expectancy that someone is to respond. Thus a question is said to serve an interpersonal control function (Nuthall and Church, 1973). In the present study, it was assumed that pupil opportunity to respond to the teacher's cognitively-directed questions depends, primarily, on the number of these questions asked in preference to affective questions, the clarity with which the questions are framed, and the repertoire of initial and sustaining questions under the teacher's control.

Consequently, increasing what is termed the student teacher's fluency-control, as well as widening his repertoire of cognitive question types, were important objectives of the sensitisation experiences in the microteaching and observation-analysis programmes.

2. The Logical Function of Teacher Questions. In addition to serving an interpersonal control function, a teacher's cognitive questions have content or meaning function (Nuthall and Church, 1973). In other words, these questions are substantive-logical in nature: they ask pupils to apply certain cognitive processes to some substantive material or subject matter in order to provide appropriate responses. Microteaching and observation-analysis provided participants with sensitisation experiences concerning the flexible use of questions having differing meaning functions for helping pupils achieve particular teaching objectives. To this end, cognitive questions which initiate a discussion lesson episode were classified into three categories by re-grouping the six hierarchical categories for educational objectives devised by Bloom *et al.* (1956). Thus low order initial questions were assumed to require pupils only to remember information, middle order questions to require the comprehension and application of ideas, and high order questions to require analysis, synthesis and evaluation of ideas. Similarly, cognitive sustaining questions were classified at different levels of cognitive demand. Low order sustaining questions were viewed as requiring pupils to provide only unsubstantiated agreement or disagreement with an idea, or the clarification of an idea. High order sustaining questions, on the other hand, were defined as those which ask pupils to critically examine a response, or to refocus the content of a response on a different but related topic.

3. Teacher-Pupil Talk Patterns. For pupils to achieve the educational objectives of a cognitively-focused discussion lesson, it is necessary for them to have ample opportunity to express their ideas. This opportunity can be affected by how often and at what length a teacher talks, as well as by the nature of what he says. In controlling a repertoire of initial and sustaining questions, for example, a teacher may question at a high frequency rate so that reciprocal teacher-pupil talk patterns will tend to predominate in which pupil opportunity for talk will be, at the most, equal to that of the teacher. On the other hand, following a pupil response to his

question, a teacher may wait for further answers or pupil-pupil exchanges to occur, and will thus create a different kind of talk opportunity. Again, different levels of cognitive demand in teacher questions may tend to lead to greater or fewer numbers of substantive ideas in pupil responses, while certain teacher behaviours may interrupt rather than encourage discussion flow. A recognition of the potential of different teacher behaviours to affect teacher-pupil talk patterns was thus an essential part of the sensitisation experience in the microteaching and observation-analysis programmes.

Selection

Bearing these points above in mind, 19 relevant teacher questioning skills and teacher-pupil talk patterns were selected as dependent variables for experimental study. This selection reflects the cognitive emphases described above, but was also influenced by the following considerations:

(i) The need to focus on behaviours that could be readily and accurately identified on transcripts produced from pre- and post-test audiotapes, subsequent analysis of which could be in quantitative terms.

(ii) For manageability reasons, the need to reduce the number of variables studied.

Initially, 41 interaction patterns were considered as potential dependent variables. Subsequently, 22 were eliminated on the above grounds. Those eliminated included teaching skills not directly involved with questioning, teacher reaction moves which evaluate pupil responses, teacher and pupil non-verbal behaviours, and certain pupil response patterns. A summary of the dependent variables in the study is presented below. Their operational definitions are given in the section following.

Summary of Dependent Variables

CONTROL FUNCTIONS OF TEACHER QUESTIONS

1. Fluency-control in questioning.
2. Cognitive episode control.
3. Episode sustaining tendency.
4. Redirection tendency.

5. Probing tendency.
6. Tendency to use pupil ideas.
7. Tendency to use structuring with questions.

LOGICAL FUNCTIONS OF TEACHER QUESTIONS

8. Asking initial questions of low order cognitive demand.
9. Asking initial questions of middle order cognitive demand.
10. Asking initial questions of high order cognitive demand.
11. Asking probing questions of high order cognitive demand.

TEACHER-PUPIL TALK PATTERNS

12. Amount of teacher talk.
13. Teacher repetition of pupil responses.
14. Asking Yes/No questions.
15. Teacher answers own questions.
16. One idea pupil responses.
17. Several ideas pupil responses.
18. Extended ideas pupil responses.
19. Coordinate-reactive pupil response patterns.

Operational Definitions

The following operational definitions of these variables were constructed. Appropriate methods of measuring each variable are discussed in detail in Chapter 7 (pp.140-142).

CONTROL FUNCTIONS OF TEACHER QUESTIONS

1. Fluency-control in questioning. The teacher uses initial and sustaining questions of a cognitive (substantive-logical) kind which are "active" in that they elicit pupil response. Excluded from consideration are: (i) habitual repetitions of questions, asking complex-confused-ambiguous questions, false-starting questions, and using attached prompts with questions; and (ii) affective, exhortatory, procedural-managerial and rhetorical questions.
2. Cognitive episode control. This variable refers to the number of discussion lesson episodes that are introduced by teacher initial questions of a cognitive (substantive-logical) rather than an affective kind.
3. Episode sustaining tendency. The teacher sustains the content focus for a discussion lesson episode introduced with his cognitive (substantive-logical) initial question by: (i) redirecting the initial question to other pupils; and (ii) by using probing questions, redirection of probing questions, framing questions that use pupil ideas, and returning pupil questions to pupils. Excluded from consideration are affective, procedural-managerial, exhortatory and rhetorical questions.

4. Redirection tendency. The teacher sustains the content focus for a discussion lesson episode introduced with his cognitive (substantive-logical) initial question by redirecting the initial question or episode sustaining questions to other pupils.

5. Probing tendency. The teacher uses sustaining questions which attempt to have pupils go beyond a first response. Except for prompts, probing questions seek to open up, deepen or broaden pupil thinking by asking them to: (i) clarify and elaborate a response; (ii) justify and think critically or evaluatively about a response; and (iii) refocus ideas in a response on a related but different topic. Probing may ask a pupil to react to his own response, or ask other pupils to react to this same response. The probing question helps to sustain the content focus for a discussion lesson episode introduced by the teacher's initial cognitive (substantive-logical) question.

6. Tendency to use pupil ideas. The teacher refers directly to the ideas in one or more previous pupil responses and asks a question or makes a statement which clearly leads out of, or draws together these ideas. Thus, related to previous pupil ideas, the teacher's question or statement may focus on an analysis, synthesis, summary, interpretation, comparison, or an inference. Teacher paraphrasing of a previous pupil response is also considered to be using a pupil idea. Using pupil ideas helps to sustain the content focus for a discussion lesson episode and, if in question form, may be asked of one pupil or of a whole group for volunteers to respond.

7. Tendency to use structuring with questions. The teacher prefaces and/or follows his initial and sustaining questions in cognitive (substantive-logical) discussion lesson episodes with a substantive or procedural statement that sets the stage for a question.

LOGICAL FUNCTIONS OF TEACHER QUESTIONS

8. Asking initial questions of low order cognitive demand. The teacher asks initial questions to have pupils remember information which has been learned previously, to describe what they observe before them, or to relate on what has been experienced in the past. Thus pupils are asked to define, recall, remember, identify, describe, report, retell, or name.

9. Asking initial questions of middle order cognitive demand. The teacher asks initial questions to have pupils show their grasp of the meaning of ideas by: (i) expressing the ideas in their own words; (ii) explaining, relating, comparing, classifying, or summarising the ideas; (iii) making inferences or predictions from the ideas; and (iv) applying the ideas to new situations. Thus pupils are asked to comprehend and apply ideas.

10. Asking initial questions of high order cognitive demand. The teacher asks initial questions to have pupils: (i) analyse the parts and the relationships among parts in some idea, event, or situation; (ii) put ideas together in new ways (for them) in order to produce a plan, predict what will happen in different circumstances, hypothesise, or solve some problem, and (iii) use

definite criteria to evaluate some idea, event, or situation. Thus pupils are asked to analyse, to create or synthesise, and to evaluate.

11. Asking probing questions of high order cognitive demand. The teacher asks pupils to go beyond first response to his initial or sustaining questions by having them: (i) justify or critically evaluate the response, or (ii) refocus the content of the response on some related but different topic. The high order probing question may ask a pupil to react to his own response, or ask other pupils to react to this same response.

TEACHER-PUPIL TALK PATTERNS

12. Amount of teacher talk. This variable refers to the total amount of talk time occupied in a discussion lesson by the teacher.

13. Teacher repetition of pupil response. The teacher repeats an immediately preceding pupil response, either verbatim or in nearly the same words.

14. Teacher asking of Yes/No questions. The teacher asks initial or sustaining questions which elicit only unsubstantiated expressions of agreement or disagreement from pupils in Yes/No form. Such responses are not followed up by the teacher with probing questions to find out the reason(s) behind the pupil response.

15. Teacher answers his own question. The teacher answers his own initial or sustaining questions which pupils have not attempted to answer, or which pupils have answered but the teacher adds his own response.

16. One idea pupil response. A pupil gives a response which contains one substantive idea only. The response may be a first answer to a teacher's initial or sustaining question of a cognitive kind, a further unsolicited answer, or an unsolicited pupil initiation of an idea as a reaction to a previous pupil or teacher response. The one idea may be contained in a one word response, or in one or more simple or complex syntactical structures which do not have to be conventional in form or sequence. Excluded from consideration are pupil Yes/No responses.

17. Several ideas pupil responses. A pupil gives a response which contains two or three substantive ideas. The response may be a first answer to a teacher's initial or sustaining question of a cognitive kind, a further unsolicited answer, or an unsolicited pupil initiation of several ideas as a reaction to previous pupil or teacher response. The several ideas may be contained in one or more simple or complex syntactical structures which do not have to be conventional in form or sequence.

18. Extended ideas pupil responses. A pupil gives a response which contains four or more substantive ideas. The response may be a first answer to a teacher's initial or sustaining question of a cognitive kind, a further unsolicited answer, or an unsolicited pupil initiation of extended ideas as a reaction to previous pupil or teacher response. The extended ideas may be contained in one or more simple or complex

syntactical structures which do not have to be conventional in form or sequence.

19. Coordinate-reactive pupil response patterns. The coordinate pupil response is a self-initiated answer to a teacher's initial or sustaining question of a cognitive kind following the first directly solicited pupil answer. The reactive pupil response is a self-initiated pupil response which is a reaction to previous pupil or teacher response. Both kinds of response may occur separately or together following a first pupil answer to a teacher's question. Though pupil-initiated, the coordinate response is an answer to a teacher question and thus represents teacher-to-pupil interaction. In contrast, the reactive response represents pupil-to-teacher or pupil-to-pupil interaction.

Attitudes towards the Microteaching and Observation-Analysis Programmes

The research literature indicates that participants in microteaching programmes are, in general, favourably disposed towards microteaching as an effective learning experience (see Chapter 3). This disposition prevails for the many different kinds of programme researched and applies to those that operate separately from, or as adjuncts to, conventional practice teaching in schools.

In the present study, the attitudes of student teachers to the differing kinds of experience offered in the various microteaching treatments could obviously be an important factor in their success, and these attitudes were accordingly assessed through an attitude questionnaire. The opinions of participants in the observation-analysis programme, on their learning experience, were similarly sought.

Experimental Hypotheses

Four null hypotheses were formulated for testing which took account of the independent and dependent variables outlined in the preceding sections. The first three of these hypotheses compared the effects of experimentally manipulating different teaching practice opportunities. There were two areas of interest: (i) the overall effect on pre- to post-test performance of each treatment, and (ii) the differential effects of treatments on pre- to post-test performance. The purpose of the fourth hypothesis was to test for

differences in attitude between various microteaching treatment groups concerning the general effectiveness of the microteaching experience provided.

HYPOTHESIS 1

In pre- to post-test performance of selected questioning skills and talk patterns by subjects experiencing a microteaching treatment (M), an observation-analysis treatment (O), and no treatment (N),

1.1 there will be no significant overall effect for each treatment, and

1.2 there will be no significant differential effects between treatments.

HYPOTHESIS 2

In pre- to post-test performance of selected questioning skills and talk patterns by subjects experiencing differing combinations of teaching practice opportunity (M, O, N) and the media used (v = videotape, a = audiotape),

2.1 there will be no significant overall effect for each treatment, and

2.2 there will be no significant differential effects between treatments.

HYPOTHESIS 3

In pre- to post-test performance of selected questioning skills and talk patterns by microteaching subjects who practise with (a) different pupils (c = children, p = peers), (b) different levels of question (m = middle order, h = high order), and (c) differing combinations of pupil, media and question level,

3.1 there will be no significant overall effect for each treatment, and

3.2 there will be no significant differential effects between treatments.

HYPOTHESIS 4

There will be no significant difference in attitude towards the general effectiveness of microteaching by student participants who practice with (a) different pupils (c = children, p = peers), (b) different media (v = videotape, a = audiotape), and (c) with

different combinations of pupil and media treatments.

The complex experimental design necessary to test these hypotheses will now be described.

CHAPTER 6

METHOD: EXPERIMENTAL DESIGN, PROCEDURES AND CONTROLS

OUTLINE: An account is provided of the experimental design and treatments. The nature of the subjects is then described, followed by an overview of the procedures used to assign subjects to treatments, to conduct pre- and post-testing, and to supervise the microteaching and observation-analysis treatments. Finally, an outline is given of the experimental controls established in an attempt to ensure both internal and external validity for the research design.

The Experimental Design

Design

Since a primary aim of the research was to examine the effectiveness of different microteaching programmes, the design of the experiment had to be able to provide answers as to (i) the extent to which a particular programme produced any effect at all, and (ii) whether some programmes were more effective than others. This called for an experimental design of the classical pre-test/treatment/post-test variety, but one also incorporating multivariate analysis.

Furthermore, the limited amount of time within which pre-testing and post-testing had to take place, together with limitations on the amount of microteaching equipment and supervisory time which could be made available, inevitably constrained the extensiveness of the project. It was decided that these factors must limit the number of student teacher subjects to approximately 100. On this basis, the overall design was constructed to include 24 subjects in each of the two main types (video and audio media) of microteaching programme, 24 subjects in an observation-analysis programme occupying approximately equivalent time, and 24 in a no-treatment group. Students in the observation-analysis programme

were also divided into two sub-groups whose experience was provided either by videotape or audiotape, and each microteaching sub-group further divided into two subgroups according to whether the treatment involved teaching children or teaching peers. The four resulting microteaching groups of twelve students each were then divided again so that eight groups of six members each could then contain three members practising middle order questions and three practising high order questions.

As shown below, the overall research design could thus be considered in three parts:

The Overall Design

		Microteaching (M)				Observation-analysis (O)		No Treatment (N)
	Media used	Video (Mv)		Audio (Ma)		Video (Ov)	Audio (Oa)	
	Question level practised	Middle order (Mm)	High order (Mh)	Middle order (Mm)	High order (Mh)			
Pupils taught	Children (Mc)	Mcvm n=6	Mcvh n=6	Mcam n=6	Mcah n=6	n=12	n=12	n=24
	Peers (Mp)	Mpvm n=6	Mpvh n=6	Mpam n=6	Mpah n=6			

The Parts 1, 2 and 3 designs

PART 1 DESIGN

	M	O	N
	n = 48	n = 24	n = 24

PART 2 DESIGN

	Mv	Ma	Ov	Oa	N
	n = 24	n = 24	n = 12	n = 12	n = 24

PART 3 DESIGN

	Mv		Ma	
	Mm	Mh	Mm	Mh
Mc	Mcvm n=6	Mcvh n=6	Mcam n=6	Mcah n=6
Mp	Mpvm n=6	Mpvh n=6	Mpam n=6	Mpah n=6

The Part 1 Design

This was set up as a one-way analysis of variance, incorporating a before and after-randomised control groups design, with fixed effects. Teaching practice opportunity of three kinds was varied, including two controls on a microteaching treatment. The microteaching treatment was balanced for the following sub-treatments: microteaching children and microteaching peers; videotape support and audiotape support; practising middle order questions and practising high order questions. In the observation-analysis treatment, there was balance for videotape and audiotape sub-treatments. With regard to the dependent variables, the purpose of this design was to test for any significant change in teaching

performance from pre- to post-test in the case of each major treatment group (microteaching, observation-analysis, and no-treatment), together with any significant differential effects for treatments.

The Part 2 Design

This was again planned to sustain a one-way analysis of variance, incorporating a before and after-randomised control groups design, with fixed effects. Teaching practice opportunity of five kinds was varied, including three controls on two microteaching treatments. Each of the media treatments in microteaching was balanced for the following sub-treatments: microteaching children and microteaching peers; practising middle order questions and practising high order questions. It should be noted that this design was not completely independent of the Part I design in that data replication would occur in the case of the no-treatment group. Nevertheless, this data was to be compared with that generated by sub-groups of treatments in the previous design. With regard to the dependent variables, the Part 2 design aimed at identifying any significant change in teaching performance from pre- to post-test, together with any significant differential effects for treatments.

The Part 3 Design

The Part 3 design was set up to accommodate a before and after-randomised 2 × 2 × 2 factorial analysis of variance with fixed effects, in which three main effects and four interaction effects could be studied:

		Microteaching Treatments					
Main Effects:							
P	Pupils	Children	Mc	Vs.	Peers	Mp	
M	Media	Videotape	Mv	Vs.	Audiotape	Ma	
Q	Question level	Middle order	Mm	Vs.	High order	Mh	

Interaction Effects:							
P × M	Mcv	Vs.	Mca	Vs.	Mpv	Vs.	Mpa
P × Q	Mcm	Vs.	Mch	Vs.	Mpm	Vs.	Mph
M × Q	Mvm	Vs.	Mvh	Vs.	Mam	Vs.	Mah
P × M × Q	Mcvm	Vs.	Mcvh	Vs.	Mvpm	Vs.	Mpvh
	Mcam	Vs.	Mcah	Vs.	Mpam	Vs.	Mpah

The treatments involved were to be examined for any significant change in teaching performance on the dependent variables from pre-test to post-test, as well as for any significant differential in main and interaction effects.

Control in this design was exercised in the generalised rather than the traditional sense of the term "control group". That is, internal validity was achieved by means of comparison groups receiving systematically different treatments within the design, reinforced by use of a randomised procedure for the selection of subjects and their assignment to treatment groups (Kerlinger, 1966: pp.304-307).

The Overall Design

While it could not be presumed, prior to the experiment, that the microteaching group as a whole would be superior to the two control groups, or that one or both of the two microteaching treatments in the Part 2 design would be superior to other treatments, it was tentatively thought that this would be the case. This being so, the three parts of the overall research design represented a logical progression ending with a factorial analysis to determine which microteaching treatment might be superior to others, or whether there was any significant difference between microteaching treatments. If the former situation applied, then, by logical inference, the treatment identified would not only be superior to other microteaching treatments but also to the observation-analysis and no-treatment groups. However, the overall design could accommodate other possibilities. Thus, for example, if it were the case that observation-analysis was a more effective treatment than microteaching, a study of the factorial section of the overall design might identify which microteaching treatment was superior to others and this, in turn, might be compared with the observation-analysis treatment.

Treatments

The microteaching treatment involved participants in five laboratory experiences, each of which followed a basic format of Analysis/Practice/Feedback except for the fourth which was entirely devoted to study of the SQUAIES Interaction Analysis Coding system.

Depending on the treatment, microteachers in each working group of six members took microlessons of 5-10 minutes' duration on a rotational basis with five Standard 3/4 primary school children, or with their five microteacher peers. There was free choice of subject matter and each microteacher taught the same group of pupils throughout the programme. Again depending on the treatment group, videotape or audiotape was used to support the Analysis, Practice and Feedback phases in each laboratory. During Teaching Laboratories 3 and 5, three microteachers in each group of six members practised initial questions of middle order cognitive demand, while the remaining three members practised questions of a high order. Apart from variations in composition for the pupil group taught, media and the question level practised, the Analysis, Practice and Feedback phases in each microteaching laboratory were standardised for all microteaching groups.

Although the observation-analysis treatment did not include teaching practice, it shared with microteaching the objective of increased sensitisation to a wide repertoire of teaching behaviours. To this end, the observation-analysis treatment incorporated the same substantive material in the same sequence over the five laboratories comprising its programme as was used in microteaching.

The experimental treatments used in the investigation may be summarised as follows:

Treatment 1: Microteaching Children - Videotape (Middle/High Order Questions) Mcv + m/h

Subjects in this treatment group microtaught children and used videotape for the informal orientation activities of the introductory session, for the presentation of cued and uncued samples of teaching in the analysis phase of each laboratory, and for immediate playback of microlessons to facilitate coding analysis by microteacher peers as the basis for feedback discussion. During the third and fifth laboratories, three microteachers in each group of six members practised middle order initial questions, while the remaining three members practised high

order initial questions. The fourth laboratory involved all members in this treatment in learning to use the SQUAIES Interaction Analysis Coding System.

Treatment 2: Microteaching Children - Audiotape (Middle/High Order Questions) Mca + m/h

This treatment was the same as Treatment 1 (Mcv + m/h) except that audiotape was substituted for videotape. All audiotape presentations of teaching samples in the analysis phase of microteaching laboratories were copies taken from the videotape soundtrack of the samples used in Treatment 1. Use of a "cueing box" enabled every skill contingently cued on the television screen in Treatment 1 to be matched in Treatment 2 (FIGURE 4.8: p.225).

Treatment 3: Microteaching Peers - Videotape (Middle/High Order Questions) Mpv + m/h

This treatment was the same as Treatment 1 (Mcv + m/h) except that instead of teaching children, subjects participated in simulated microteaching of the five microteacher peers in their laboratory group. Rather than being a rôle-playing activity, simulated microteaching involved curriculum material at an adult level so that microlessons had genuine educational objectives. All microteachers in this treatment were "participant-observers"; that is, at different times they were microteachers, genuine 'pupils', and observer-coders of videotape replays of peers' teaching in order to provide objective data for feedback discussion purposes.

Treatment 4: Microteaching Peers - Audiotape (Middle/High Order Questions) Mpa + m/h

This treatment was the same as Treatment 3 (Mpv + m/h) except that audiotape was substituted for videotape. As occurred in Treatment 2, a "cueing box" was used to contingently focus skills in the first presentation of a teaching sample in the analysis phase of each

laboratory.

Treatment 5: Observation-analysis - Videotape Ov

This treatment used videotaped teaching samples to duplicate the analysis phase activities of micro-teaching treatments 1 and 3 (Mcv + m/h and Mpv + m/h). However, two sessions rather than one session only were spent on this analysis work in each laboratory. No teaching practice opportunities were provided, the concentration being solely on interaction analysis. In the fourth laboratory, this treatment matched that of all microteaching groups in study of the SQUAIES Interaction Analysis Coding System.

Treatment 6: Observation-analysis - Audiotape Oa

This treatment was the same as Treatment 5 (Ov) except that audiotape was substituted for videotape to duplicate the analysis phase activities of micro-teaching treatments 2 and 4 (Mca + m/h and Mpa + m/h). Once again, two sessions in each laboratory were spent on this work.

Treatment 7: No Treatment N

Subjects in the no-treatment group received no special programme on teaching skills and merely pursued their normal programme of professional studies in the Teachers College.

Subjects

The subjects were 96 student teacher volunteers who, for the duration of the experiment, were initially in their second, and then in their third and final year, of pre-service education at the Hamilton Teachers College. They were drawn, assigned to groups, and assigned further to treatments within these groups by means of a stratified randomisation procedure from a pool of 203 volunteers out of a total non-School of Education population of 211 students. Non-School of Education students take both their general and professional studies in the Hamilton Teachers College, whereas students in the School of Education pursue identical professional

studies in the teachers college but attend the University of Waikato on the same campus for other courses. Because of time-tabling difficulties, 120 School of Education students out of 331 Year 2 students were not considered as experimental subjects.

The stratification factor used in randomly assigning subjects to groups was high-low dogmatism as measured by the Rokeach Dogmatism Scale Form E (Rokeach, 1960). The use of dogmatism was based on the indications in a number of research studies that teachers tend to resist, or be open to, ideas and behavioural change depending on whether they are high scorers or low scorers respectively on the Rokeach test (Hough and Amidon, 1964, 1965; Zahn, 1965; Amidon and Hough, 1967; Hanny, 1967; Johnston, 1967; Ober, 1967; Cappelluzzo and Brine, 1969; Johnson, 1969; Musella, 1969; Vacchiano *et al.*, 1969; Cohen, 1971; Gregg, 1971; Shaver and Richards, 1971; Thew, 1973).

The population of students volunteering to participate in the study contained 43 males and 160 females. Unfortunately, male-female representation in the various treatment groups could not be made proportionate. This was due to an imbalance in the proportions for high-low dogmatism scores in the small sample of males available. In the light of the research on dogmatism mentioned above, however, it was considered more important to control for "openness" than for sex. Consequently, the male-female variable was disregarded when randomly assigning subjects to treatments. There was no attrition of subjects between the pre-test and post-test phases of the study.

The rationale for using Year 2-Year 3 student teachers as subjects was as follows:

1. In order to minimise the influence of extraneous variance on experimental outcomes due to sensitisation, it was desirable that neither the pre-test and treatment, nor the treatment and post-test, phases in the experiment should be immediately contiguous. Again, the investigator wished to use a delayed rather than an immediate post-test. Both of these requirements were met by the Teachers College course structure from the third term in Year 2 to the second term in Year 3 which was in the sequence practice-teaching-in-schools/college-studies/practice-teaching-in-schools, with

vacation periods separating each component. In addition, the college-studies period in the first term of Year 3 was of appropriate length for conducting the treatment phase (see FIGURE 6.1: p.226).

2. An elective component in the Year 3 professional studies programme which was not formally examined, was an ideal placement for a microteaching programme which encouraged self-evaluation. Moreover, the scheduled class hours for this course were two one-hour periods weekly which permitted two one-and-a-half hour laboratories per week for microteaching without unduly increasing students' committed hours. The latter could have led to negative student reaction to the microteaching programme.

3. Scheduling the pre-test during school teaching practice in the third term of the Year 2 course afforded an opportunity to informally evaluate the impact on students' questioning skills of the professional studies courses immediately preceding this period. These courses were Learning and Teaching, Studies in Teaching Mathematics and Studies in Teaching Language, all of which included some study of questioning skills in their respective curricula.

As Rosenthal and Rosnow have pointed out (1969: pp.59-118), the use of volunteers for research purposes may tend to provide data which supports the investigator's directional hypothesis, or may also lead to biased estimates of population parameters being made. Among other characteristics, for example, volunteers are likely to be more arousal-seeking, be of higher intelligence, and have higher educational standing. In the light of these comments, concern was felt for the possible generalisability of experimental findings but, as it was, 203 out of 211 of the non-School of Education population in Year 2 volunteered as prospective subjects. This meant that the subjects finally used were 96 stratified and then randomly selected students from a population consisting almost entirely (97 percent) of volunteers -- an event which tended to offset the problem which Rosenthal and Rosnow raise.

Procedures

Assigning Subjects to Treatments

At the investigator's orientation meeting with Year 2 non-School of Education students in the second term of 1973 (FIGURE 6.1: p.226), students were informed of the availability the following year of an elective course on teaching skills. Other information provided was purposely kept general: the emphasis would be on teaching skills applicable to taking discussion lessons and would involve a combination of interaction analysis and teaching practice. No mention was made of microteaching procedures. Students were asked to complete a form indicating their willingness (or not) to be considered as course members on the understanding that membership would be based on a random draw of names, and on a further random assignment to one of three groups.

An organisational rationale was provided for the use of these randomisation procedures. It was explained that because only three lecturers would be available to teach the course which required small group teaching, three different ways of taking the course would need to operate during the following year. Students were also informed that those not selected to take the course in the first term would participate in an interim elective course to meet college academic requirements; again, that all three groups would have "a diagnostic discussion session" audiotaped during their forthcoming school practice period so that objectives for the course on teaching skills might be based directly on an analysis of actual student needs.

Both of these procedures were designed to be experimental "blinds". First, the organisational rationale was used in order to exercise control over the possible influence of Hawthorne Effect on experimental outcomes. The first and second group would involve microteaching and observation-analysis subjects who would take the course in Term 1, and in Terms 1 and 3 respectively. The third group constituted the no-treatment condition in the study and were to take the course in Term 3 when all experimental phases had concluded (FIGURE 6.1: p.226). It was hoped that subjects in the first two groups would not see themselves as singled out for special

attention, but merely as students completing a course under a different arrangement from other students. Secondly, the intent of the "diagnostic discussion session" (pre-test) was that students should perceive the experience as something personally and professionally supportive rather than as a test *per se*, thus reducing sensitisation which might systematically bias pre-test performance.[1]

Upon completion of the volunteer membership forms, 125 students were selected, assigned to three groups, and assigned further to treatments within these groups using a stratified randomisation procedure involving four levels of dogmatism: Very High, High, Low, and Very Low (see FIGURES 6.2 and 6.3: pp.227-28). This procedure gave the investigator rigorous control over the equalisation of groups as being representative of their population. It was especially important in the case of the Part 3 factorial design where six observations only per cell erred on the small side for the measurement of any possible three-way interaction effects.

Of the 125 students selected on the basis described, 29 were "spares" beyond the 96 subjects required. Five of these "spares" were used as replacements for subjects in the initial selection who left the Teachers College before the treatment phase began. The remainder were allocated equally to the two observation-analysis treatment groups and, although post-tested, were not considered for experimental data purposes.

Pre-testing and Post-testing

Pre-testing and post-testing were conducted during the Year 2 and Year 3 teaching practice blocks respectively when subjects were posted to primary schools in the South Auckland Education Board District (FIGURE 6.1: p.226). For each test, a time lapse of 7-9 weeks was allowed between the briefing session and the date of testing. This was made possible by scheduling the briefing session at the end of the academic term preceding a vacation, and then

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1 The same rationale was used for subsequent post-testing of the observation-analysis and no-treatment groups: because of the time lapse since the first diagnostic lesson, it was deemed necessary to conduct a further "diagnosis".

delaying visits to schools until subjects had several weeks' familiarisation with their respective classrooms. In the case of the post-test, this time lapse constituted a delayed post-test condition.

For each test, subjects were asked to undertake a task similar to those attempted during microteaching sessions in the experimental programme. The task consisted of leading a discussion based on story stimulus material with a group of five Standard 3/4 children. Although this produced two teaching samples only for comparison purposes, it would have been beyond the scope of the research design to sample further.

The two stories for the pre-test and post-test were chosen by the investigator to meet the following criteria: (i) equivalent interest and vocabulary difficulty level for boys and girls in the 9-10 year old age range, who were of average to above average in language ability; (ii) matched in terms of being non-fiction stories centring on a problem situation in which an element of mystery occurred; and (iii) equivalent potential for generating teacher questions of low, middle and high order cognitive demand (Appendices A.3 and A.7: p.360 and p.373).

Directions given to subjects were identical on the occasion of each test. They were to allow up to 15 minutes for the children to read their copy of the story and then discuss it with them for 10 minutes so that, <u>in the main</u>, the children were encouraged to <u>think</u> about ideas the story contained. This general statement of teaching intention was underlined (as shown here) on the directions sheet issued to subjects, and was made even more explicit by providing a list of key words which referred to questions of middle and high order cognitive demand that might be used (Appendices A.2 and A.6: p.359 and p.372).

All pre-test and post-test discussion lessons were audiotaped using a Sanyo cassette audio-recorder Model M-2500 which has automatic level recording and shut-off systems. These recordings were then transcribed for subsequent analysis which provided the data for measurement purposes.

Controls against the influence of extraneous variance on pre- and post-test performance were exercised by standardising for each

test: (i) the information given to subjects at briefing sessions; (ii) the time allowed for the discussion lesson; (iii) the size, age range and ability level of the pupil group taught; and (iv) the procedures used by the two supervisors who conducted testing in the field. In addition, a check on comparability for the two stories was made prior to the pre-test by having six experienced teachers of Standard 3/4 children pilot the test stories in their own classrooms. These teachers were given the same set of directions as those issued to the experimental subjects, but were also provided with the criteria used by the investigator in selecting the stories. As a result of the evaluation made, it was decided that the two stories were comparable in terms of the criteria established. (Copies of all materials pertinent to items mentioned in this paragraph may be found in Appendix A.8: p.376).

Because college regulations required student teachers to be placed in a different school for each period of practice teaching, subjects were unable to teach the same group of children on the occasion of their pre-test and post-test lessons. However, the investigator was able to control the school practice situation to the extent that all subjects were able to take their pre- and post-test lessons with Standard 3/4 children. Either subjects were placed in this division of the primary school, or, where they had to be placed in the junior or senior school divisions, the Principal arranged for an "adopted" group of Standard 3/4 pupils to be available. In the latter circumstances, subjects were given ample opportunity for informal familiarisation sessions with their adopted group prior to the pre-testing (or post-testing) date (Appendix A.9: p.381).[2]

The geographical location of subjects during pre- and post-testing in schools was widely distributed. With only the investigator and one assistant available for school visiting, it took approximately 15 school days on the occasion of each test to complete audiotaping of all discussion sessions. It was felt, however, that this time span was not so great as to bias data for

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2 Field records kept on pre- and post-testing indicated that approximately one-half of the subjects in each of the micro-teaching, observation-analysis and no-treatment groups used "adopted" Standard 3/4 pupils for each test.

comparison groups due to contemporary history factors.

Supervision

Supervisors of the microteaching and observation-analysis treatment groups in the study were the investigator and two assistants, all of whom were experienced teachers and university graduates with training in classroom interaction analysis. The preparation of supervisors was conducted by the investigator and involved daily sessions over a three-week period immediately prior to the treatment phase in the experiment. These sessions included handling the videotape and audiotape equipment, actually undergoing the microteaching programme, and simulation activities designed to teach the non-directive supervision rôle that was to be used with all microteaching and observation-analysis groups. In short, all three supervisors experienced first-hand the sensitisation process planned for the experimental subjects.

An important feature of this preparatory programme was initial training in the SQUAIES Interaction Analysis Coding System. This training continued up until the fourth laboratory in the study when the SQUAIES system was the main sensitisation experience for all microteaching and observation-analysis treatment groups.

Ideally, the three supervisors would have been involved in supervising all types of microteaching and observation-analysis treatment on a rotational basis, and "blind" spot-checks would have been made on their actual feedback behaviour with microteachers. Timetable and technician limitations made this impossible. However, two out of the three supervisors were involved with each type of microteaching treatment, and one with each of the two observation-analysis groups. The best means available to the investigator for holding constant the supervision process in microteaching feedback sessions were the detailed briefings that preceded each laboratory. Though not entirely satisfactory as a control measure, it appeared from discussion at these sessions that each supervisor was meeting the criterion of non-directiveness that was required.

Experimental Controls

In drawing up and actioning the research design, the following experimental controls were incorporated in an attempt to ensure both internal and external validity:

Maximisation of Systematic Variance

This was attempted by making the distinction between the various experimental treatments as clearcut as possible so that their individual effects on the dependent variables could be more easily identified. In particular:

1. The experimental treatments systematically varied three microteaching variables (composition of pupil group, the practice and feedback media, and level of cognitive demand for initial questions practised), and balanced these with two distinct control treatments to help identify any Hawthorne Effect.

2. A check was made that the assigned practice levels for initial questions of either middle or high order cognitive demand were operating as planned. TABLE 6.1 (p.229) confirms that this occurred, there being only a small amount of variability within and between the two treatments.

Control of Extraneous Variance

Procedures designed to minimise the influence of extraneous variance on the experimental results were:

1. Subjects were selected who, during the treatment phase of the experiment, would all be taking the same Year 3 professional studies coursework, thus equalising the effects of any intersession developments which included discussion of questioning skills.

2. A stratified randomisation of subjects was used in assigning them to treatment groups, stratification being on the basis of high-low dogmatism as measured by the Rokeach Dogmatism Scale, Form E.

3. Subject sensitisation effects were reduced by:

   (a) involving all subjects (whether assigned to microteaching or control groups) in an equivalent amount of course time, albeit by different organisational arrangements, so that no group would see itself as singled out for special treatment;

   (b) providing disguising rationales for the pre- and post-test school observations which were presented to students as producing diagnostic material for the setting up of course objectives; and

   (c) ensuring that at least 7-9 weeks elapsed between briefing sessions for the pre- and post-tests and the visits to schools for each test.

4. A check on the attendance of participants in the various microteaching treatments and in the observation-analysis control group. TABLE 6.2 (p.229) confirms that the attendance rate was high over all treatment groups.

Minimising Error Variance

The following constants were maintained in order to control for unwanted error variance:

1. Standardising the curriculum content, content sequencing, basic procedures and course time for all experimental treatments in microteaching.

2. Matching the content, and content sequencing, in teaching laboratories for the observation-analysis treatment group with that of the Analysis phase in each of the microteaching laboratories.

3. Standardising the pre- and post-testing directions and procedures, including a check on the comparability of the two stories used for each test as well as effort to match the pupil groups taught by subjects in the different treatment groups.

CHAPTER 7

METHOD: DATA COLLECTION, MEASUREMENT AND STATISTICAL PROCEDURES

OUTLINE: A description is provided of the SQUAIES Interaction Analysis Coding System which was used (a) in simplified form for analysis of teaching purposes in the microteaching and observation-analysis treatments in the study, and (b) in a more sophisticated form for collecting pre-test and post-test data related to the dependent variables measured. Consideration is then given to several measurement problems which determined that ratio measures be used to assess performance on some of the dependent variables. Also described are the attitude questionnaires administered to microteachers and observation-analysis participants. Finally, the statistical procedures which were used to test the experimental hypotheses are detailed.

Data Collection: Questioning Skills and Teacher-Pupil Talk Patterns

Criteria for the Data Collection Instrument

To be valid, educational measurement and evaluation requires that the content and nature of the measuring instrument should reflect the learning objectives and experiences of those being evaluated. The present study attempted to meet this criterion by developing, interdependently, a category system which could be used both for the analysis of classroom performance and also as part of the curriculum for a microteaching and observation-analysis programme. Built into laboratory sessions as a progressive learning sequence, the category system became an integral part of teaching analysis activities as well as being the instrument for collecting data from pre-test and post-test lesson transcripts. In addition, the measures developed on the basis of the category system were tied to the types of analysis of teaching made by microteachers and observation-analysis participants during their laboratory sessions.

The category system used in the study was the SQUAIES Interaction Analysis Coding System. Designed by the investigator, it evolved following a review of the many category systems already available, none of which fully satisfied the specifications required by the experimental study. These specifications were:

1. The category system should be capable of analysing verbal interaction in teacher-led discussion lessons with small groups of pupils in middle and upper primary school teaching situations, in which the teaching focus concerned some relatively self-contained unit of subject matter, such as a story, poem, picture or social studies situation.

2. It was desirable that the analysis system be based on a theoretical model, but that neither this model nor the empirical instrument it generated, should reflect a commitment or value position concerning one way of teaching being superior to others. The system had simply to provide an objective and reliable record of what a teacher and his pupils actually did verbally during a discussion lesson.

3. The categories in the analysis system needed to encompass a fairly wide range of behaviours, but most emphasis was to be placed on teacher questioning of a cognitive kind. Each behaviour had to be operationally defined as a mutually exclusive category, facilitating low inference coding by trained judges and thus reliability for the system as a whole.

4. As a reliable empirical instrument, the analysis system was required to describe the form, function and sequence of verbal utterances made by the teacher and pupils as shown in transcripts of pre- and post-test discussion lessons in the study. It was desirable that the investigator should be able to readily discern both the sequential patterns for these utterances and the total frequencies with which different kinds of utterances were used. To meet this requirement, the coding system would need to utilise some comprehensive unit of analysis within which specific behaviour patterns would become evident, while coded transcript data had to be transferable to a flow chart to afford quick, quantitative analysis.

5. It was important to be able to simplify the system for coding pre- and post-test lesson transcripts by collapsing some of

The category system used in the study was the SQUAIES Interaction Analysis Coding System. Designed by the investigator, it evolved following a review of the many category systems already available, none of which fully satisfied the specifications required by the experimental study. These specifications were:

1. The category system should be capable of analysing verbal interaction in teacher-led discussion lessons with small groups of pupils in middle and upper primary school teaching situations, in which the teaching focus concerned some relatively self-contained unit of subject matter, such as a story, poem, picture or social studies situation.

2. It was desirable that the analysis system be based on a theoretical model, but that neither this model nor the empirical instrument it generated, should reflect a commitment or value position concerning one way of teaching being superior to others. The system had simply to provide an objective and reliable record of what a teacher and his pupils actually did verbally during a discussion lesson.

3. The categories in the analysis system needed to encompass a fairly wide range of behaviours, but most emphasis was to be placed on teacher questioning of a cognitive kind. Each behaviour had to be operationally defined as a mutually exclusive category, facilitating low inference coding by trained judges and thus reliability for the system as a whole.

4. As a reliable empirical instrument, the analysis system was required to describe the form, function and sequence of verbal utterances made by the teacher and pupils as shown in transcripts of pre- and post-test discussion lessons in the study. It was desirable that the investigator should be able to readily discern both the sequential patterns for these utterances and the total frequencies with which different kinds of utterances were used. To meet this requirement, the coding system would need to utilise some comprehensive unit of analysis within which specific behaviour patterns would become evident, while coded transcript data had to be transferable to a flow chart to afford quick, quantitative analysis.

5. It was important to be able to simplify the system for coding pre- and post-test lesson transcripts by collapsing some of

its categories so that microteachers could also use it for on-the-spot analysis of videotape or audiotape replays of micro-lessons. To this end, it was important that sequential patterns in verbal interaction could be easily and clearly displayed on a flow chart in order to facilitate comparison of teaching intentions with teaching actualities. By ensuring that main categories for verbal utterances were the same in both the complex and simpler versions of the coding system, it could be validly used in pre- and post-testing as well as in the treatment phase of the study.

The SQUAIES Interaction Analysis Coding System

The SQUAIES Interaction Analysis Coding System developed for the purposes of the present study was based substantially on other systems for analysing teacher-pupil verbal interaction devised by Smith and Meux (1962), Bellack *et al.* (1966), Flanders (1970), Amidon, Amidon and Rosenshine (1969), Nuthall (1970) and Nuthall and Church (1973). In addition, the system drew upon a variety of other sources for its behavioural categories, principally the many pilot and more formal studies undertaken at major research and development centres in teacher education throughout the United States (e.g., The Far West Laboratory for Educational Research and Development, The Northwest Regional Educational Laboratory, The Stanford Center for Research and Development in Teaching, and The Research and Development Center for Teacher Education at the University of Texas at Austin). Of all these sources, that of Bellack *et al.* (1966) had most influence on the underlying structure for the SQUAIES system.

In order to develop SQUAIES the following steps were taken:

1. The conceptual framework within which teacher-pupil verbal behaviour in discussion lessons could be analysed was incorporated into a theoretical model. Structural components and verbal categories in this model were operationally defined and checked by means of a series of classroom observations to confirm that an appropriate behavioural repertoire organised in a viable structure was being presented.

2. From this theoretical model, an empirical model was produced which reflected the desired goals of pointing up the

pivotal role of teacher questions in discussion-type lessons.

3. Based on Steps 1 and 2, a coding system was developed to analyse transcripts of discussion lessons. This instrument was then reformulated to produce a less complex version which would facilitate on-the-spot coding of videotape and audiotape replays of microlessons in a microteaching programme. For both levels of the coding system, a flow chart was designed which provided a graphic display of the sequences for teacher and pupil verbal behaviours, and which could also generate quantitative data.

4. A manual for the more complex SQUAIES Level 2 system was then written for the analysis of lesson transcripts by trained coder-judges. Concomitantly, a learning sequence for the simpler Level 1 system was built into the laboratory manuals for the micro-teaching and observation-analysis programmes in the study. Informal checks were taken on the reliability of each level of the coding system and, for categories presenting coding problems, necessary adjustments were made to the pertinent operational definitions and illustrative classroom examples in the manuals.

The Theoretical and Empirical Models

The SQUAIES Interaction Analysis Coding System represents a modification to, and an extension of, the model of classroom discourse developed by Bellack *et al.* (1966). These researchers distinguished four basic types of moves made by teachers and pupils, each type serving a different kind of pedagogical function: (i) Structuring moves set the context for subsequent behaviour by launching or halting-excluding interaction, and by indicating the nature of the interaction; (ii) soliciting moves directly elicit verbal, physical or mental responses so that all questions are solicitations, as also are commands, imperatives and requests; (iii) responding moves fulfil the expectations of solicitations and thus bear a reciprocal relationship to soliciting moves and occur only in relation to them; and (iv) reacting moves are occasioned by a structuring, soliciting, responding or another reacting move, but are not directly elicited by them and thus serve to modify by clarifying, synthesising or expanding, or to rate positively or negatively what has been said previously.

These four categories of pedagogical moves were used by Bellack *et al.* as the basis for a unit of analysis called the teaching cycle for which twenty-one major types were identified in discussion lessons, the most frequently occurring being the sequence: teacher solicitation/pupil response/teacher reaction. The teaching cycle was defined as beginning with either a structuring move or a solicitation that is not preceded by a structuring move, and ending with the move which precedes a new cycle. Within teaching cycles, structuring and soliciting were regarded as initiatory moves while responding and reacting moves had a reflexive property. All of these moves could be performed by a teacher or a pupil, although Bellack *et al.* observed that it was predominantly the teacher who initiated teaching cycles.

As shown in FIGURE 7.1 (p.230), the theoretical model for the SQUAIES Interaction Analysis Coding System incorporates Bellack *et al.*'s teaching cycle within the framework of a larger unit of analysis called the discussion episode. Typically, a classroom discussion lesson led by a teacher relates to an overall substantive theme which divides structurally into a series of sub-topics or substantive focuses, each of which constitutes an episode. Thus an episode consists of all the teacher and pupil verbal moves which relate to one sub-topic or substantive focus within an overall discussion theme. As defined here, the episode is the content unit of the same name identified by other investigators (Smith and Meux, 1962; Nuthall, 1970; Nuthall and Church, 1973).

In combining the episode and the verbal move as basic units for the analysis of discussion lessons, the SQUAIES theoretical model retains the view of Bellack *et al.* that pedagogical moves may serve an interpersonal control and/or meaning function. Thus, for example, a teacher question may not only indicate that someone is to respond, but also what kind of content is to be included in the response. On the other hand, the telling of information by the teacher appears to have only a meaning function, while the issuing of instructions has no reference to subject matter and seems, therefore, to be concerned primarily with control function (Nuthall and Church, 1973).

Meaning function in the SQUAIES theoretical model, however,

extends and re-defines the functionally different kinds of meaning that may be communicated by the categories of teacher and pupil moves which were proposed by Bellack *et al.* First, in keeping with the view of these researchers, some verbal moves are regarded as having substantive-logical meaning: they have to do with certain substantive information and with certain cognitive processes that are required to deal with that information. However, in the SQUAIES model the analysis of cognitive processes by Bloom *et al.* (1956) is substituted for that made by Bellack *et al.* Secondly, Bellack *et al.*'s view is adopted that some verbal moves may have instructional-logical meaning: they have to do with procedural-managerial and didactic matters, and with the thinking processes that are required to deal with these matters. Instructional-logical meaning would be present, for example, in the rating of the truth, appropriateness or acceptability of statements. Thirdly, however, the SQUAIES theoretical model extends the meaning function dimension of Bellack *et al.* to include a substantive-affective component that is based on the analysis of thinking in the affective domain by Krathwohl *et al.* (1956).

The decision to use the episode as the larger unit of analysis resulted in a further modification to the model for pedagogical moves devised by Bellack *et al.* Guided by the observation of Smith and Meux (1962) that discussion lesson episodes tend to have initiatory, continuing and terminal phases, the pedagogical moves of structuring and soliciting (alone or in combination) are regarded in the theoretical model of SQUAIES as being able to initiate or sustain the substantive focus of an episode. On the other hand, verbal moves in the terminal phase of an episode are included under the sustaining category of reacting moves, in the sense that they sustain the substantive focus of an episode up until the point that they end it.

This modification was of significance in translating the theoretical model for SQUAIES into a working or empirical model upon which the structure of the coding system was more directly based. As shown in FIGURE 7.2 (p.231), the empirical model emphasises the interest of the present investigation in the teacher's pivotal rôle in discussion lessons through the use of a repertoire of questioning and reacting skills, as well as in the

sequence patterns for these skills within and across discussion episodes. Thus the empirical model re-organises the reciprocal move possibilities evident in the theoretical models of both Bellack *et al.* and SQUAIES to produce a four-part structure in which three components refer to the teacher's pedagogical moves and one component only is reserved for pupil moves. It will be observed in FIGURE 7.2, however, that all four pedagogical moves of structuring, soliciting, responding and reacting by pupils are subsumed under this single structural component.

FIGURE 7.3 (p.232), which is based substantially on the work of Nuthall and Church (1973), presents a more dynamic picture of the verbal move possibilities within a discussion episode. Here, the directional lines indicate decision points on teacher control of discussion which carry with them differing potential for meaning transaction. It will be observed that this dynamic model not only points up the teacher's pivotal rôle during discussion, but also allows for the possibility of pupils initiating and sustaining episodes.

The Coding System

As shown in FIGURE 7.4 (p.233), the SQUAIES Interaction Analysis Coding System includes 45 main and extended categories for the identification and coding of teacher and pupil verbal moves which might be used within a discussion lesson episode. The move categories are grouped under four headings to match the empirical and dynamic models, both of which highlight the teacher's rôle in initiating and sustaining discussion episodes:

SQU — Teacher STRUCTURING and INITIAL QUESTION moves which initiate an episode. Structuring moves are regarded as having either substantive-logical or instructional-logical (procedural) function -- hence the categories S^{sub} and S^{proc}. Initial questions are coded in terms of their substantive-logical meaning functions.

AI — Pupil ANSWER moves to teacher questions of an initial and sustaining kind, as well as pupil INITIATIONS as reactions to verbal moves made by

the teacher or other pupils. In Bellack *et al.*'s terms, the AI category subsumes all pupil responding, reacting, structuring and soliciting moves which may have substantive-logical, substantive-affective or instructional-logical functions.

E — Teacher moves which are EVALUATIVE reactions to pupil responses and thus have an instructional-logical function.

S — Teacher questioning and comment moves which are cognitive reactions to pupil responses and thus have substantive-logical function which helps to SUSTAIN the substantive focus for a discussion episode. Teacher structuring moves which are independent of, or are adjuncts to, sustaining questions, may have either substantive-logical or instructional-logical (procedural) function -- hence the categories SS^{sub} and SS^{proc}.

Some verbal moves by a teacher may occur in either the initiatory or continuing phases of a discussion lesson episode, e.g., rhetorical questions, procedural questions, repeated questions, or questions having a substantive-affective meaning function. Moves of this type are presented in a separate section from the basic SQU-AI-E-S structure of the coding system, but directional lines indicate their dual rôle (see FIGURE 7.4: p.233).

A detailed account of the procedures for the analysis of lesson transcripts using SQUAIES Level 2 may be found in the SQUAIES Manual (Katterns, 1974). This manual contains operational definitions for all categories in the system, the coding ground rules, illustrative classroom examples, and samples of coded transcripts. In addition, the manual provides information on the less complex SQUAIES Level 1 system.

Analysis of Lesson Transcripts

Transcripts from audiotapes of pre-test and post-test discussion lessons were prepared by the investigator and a research assistant. Each transcript covered the first ten minutes of the

lessons taken.

To facilitate coding and analysis, all transcriptions were made on a standard form using a prescribed set of conventions. The two transcribers met regularly to discuss problems and to cross-check randomly chosen transcripts for their accuracy. In most cases, the audiotapes were sufficiently clear to be able to produce a complete written record: for the few transcripts which presented audio difficulties, the term "indiscernible" had to be entered, on average, 6-8 times in a ten-minute lesson. A sample of a coded transcript is provided in Appendix B.1 (p.394).

Training of Coder-judges

Four coder-judges were trained to use SQUAIES Level 2 in readiness for analysing pre-test and post-test lesson transcripts. The judges were a teachers college lecturer, a graduate student in Education, a research assistant and the investigator, all of whom were familiar with observational systems for the analysis of teacher-pupil interaction. Though not desirable, it became necessary for the investigator to join the coding team because of the limited availability of personnel at the end of the academic year when transcript coding was scheduled. However, the use of pairs of coder-judges, as well as reliability checks, provided safeguards against the possibility of bias in coding due to the investigator's presence.

The training programme in SQUAIES consisted of five laboratories of two hours each which were scheduled once weekly over a five-week period. Learning experiences involved coding practice with transcripts of pre-test and post-test lessons taken by student teacher "spares" (see Chapter 6), supplemented by assigned study of the SQUAIES Manual and completion of coding exercises on an independent basis. Each coder-judge spent approximately 20 hours learning to use the coding system. Inter-coder reliability checks taken during the training period produced proportion-of-agreement coefficients with a median of .86 for main categories and .73 for extended categories. Although higher levels would have been desirable, a pattern of increasing reliability was clearly evident and the investigator felt confident to proceed with the analysis

of pre- and post-test transcripts.

Reliability of Coding

The analysis of pre-test and post-test lesson transcripts proceeded in two stages. First of all, the investigator marked off episodes in all transcripts and then the four coder-judges, working in independent pairs, analysed transcripts using SQUAIES Level 2. The latter procedure followed the recommendation of Smith and Meux (1962) that the combined judgment of a pair of judges significantly reduces the occurrence of "sheer oversights" and "accidental skips" in using the criteria for categorising verbal moves when both these criteria and the material in lesson transcripts are complex.

The following steps were taken in order to check on the reliability of the investigator's episode divisions, and to maintain a consistently high level of reliability for SQUAIES coding:

1. A second judge marked off episodes in five pre-test and five post-test transcripts which had been randomly chosen and specially typed by a secretary who had no other involvement with the research. Subsequently, ten inter-judge reliability checks were made.

2. The secretary also randomly selected and assigned all lesson transcripts to ten pre-test and ten post-test sets, arranged each of these in five pairs of sets, and randomly chose one transcript in each pair to be in common.

3. Over a coding period of twenty days, each pair of coder-judges analysed one set of transcripts every two days which culminated in an inter-judge reliability check using the transcript that, unknowingly, had been coded in common. Thus ten checks on inter-judge agreement became available. During each check session, the pairs of judges reached consensus on coding disagreements, studied the manual on special coding problems, and made necessary alterations to transcripts in their respective coding sets. However, only initial codings for transcripts coded in common were used for calculating coefficients of inter-judge agreement.

The reliability estimate used to assess the dependability of the operational criteria for making off episodes, and for SQUAIES

coding, was based on percentage of agreement between judges. A coefficient of agreement was obtained using the formula:

$$R = \frac{A_{XY}}{\text{Max } (E_X, E_Y)}$$

where A_{XY} is the number of agreements between judges or pairs of judges X and Y, and Max (E_X, E_Y) is the numerically larger of the total number of instances identified by each judge or pair of judges (Smith and Meux, 1962).

An additional check on the level of inter-judge agreement for SQUAIES coding was made using the procedure outlined by Flanders (1960) for obtaining Scott's pi coefficient.

The median coefficients of inter-judge agreement for dividing lesson transcripts into episodes were .77 and .87 for the pre-test and post-test samples respectively (TABLE 7.1: p.234). It might appear at first that these coefficients are not especially high. However, when applied to a small number of episodes in a transcript, the formula above was most stringent. For example, one disagreement out of a total of five episodes, or two disagreements out of ten, immediately dropped the coefficient to the .80 level.

Inter-judge reliability estimates for SQUAIES coding related (i) to all dependent variables taken together, and (ii) to each dependent variable separately. Concerning the first type of estimate, the pre-test median coefficient of inter-judge agreement was .97 for main and .88 for extended categories, while the post-test median coefficients were .93 and .87 for main and extended categories respectively. The Scott coefficients were .83 for the pre-test lesson coding and .82 for post-test coding (TABLE 7.2: p.235). In discussing his ten-category interaction analysis system, Flanders (1960) suggested that a Scott coefficient of .85 or higher is a reasonable level of performance for inter-coder agreement. Considering the larger number of categories involved when coding with SQUAIES, the Scott coefficients obtained were thus thought to be fairly satisfactory.

The inter-judge reliability data for each dependent variable taken separately are presented in TABLE 7.3 (p.236). While the levels here were generally high, low estimates were found for the

variables "using pupil ideas" and "answering own questions". This could have been due to a number of factors but, in this instance, it seems likely that the primary factor was the low incidence of these two behaviours. Of greater concern, however, was the median reliability estimate of .59 for high order initial questions in post-test coding as opposed to a 1.00 estimate for pre-test coding -- a factor which had to be borne in mind in subsequent interpretation of experimental outcomes.

Summarising Data

Coding entries for each subject's pre-test and post-test transcripts were recorded on two SQUAIES flow charts to facilitate frequency counting of verbal moves and the transfer of this data to a separate summary form (Appendices B.2 and B.3: pp.402-404). Subsequently, data on this summary form was used for measurement purposes (Appendix B.4: p.405).

Data Collection: Attitudes towards Microteaching and Observation-Analysis

In order to assess the attitudes of microteaching and observation-analysis participants towards their respective programmes, an opinion questionnaire was administered during the final laboratory session. The questionnaire for each group was constructed as a Likert-type scale made up of statements to which respondents were required to indicate their level of agreement or disagreement on a five-point scale: Strongly Agree, Agree, Undecided, Disagree, Strongly Disagree. Respondents were asked to make a scale entry for every item and, if they wished, to add comments in the space provided. Both questionnaires concluded with a written response section which contained general evaluative items.

The opinion questionnaire administered to microteachers had four separate forms, one for each of the treatment groups combining the microteaching of children or peers with either videotape or audiotape support. Each form of the questionnaire contained many items in common with the other forms but included items which

pertained specifically to the microteaching treatment concerned. The questionnaires attempted to tap microteachers' opinions on the following areas:

1. General effectiveness of the microteaching programme.
2. Advantages and disadvantages of group learning.
3. Effectiveness of components within the microteaching format, e.g., analysis sessions, laboratory manuals, feedback sessions.
4. Organisation of the microteaching programme.
5. Specific treatment conditions, e.g., teaching children, teaching peers, videotape support, audiotape support.
6. Main qualities of an effective microteaching supervisor, the most difficult skills to acquire, major impacts of the course, and recommendations on how to improve the course.

Two separate questionnaire forms were administered to observation-analysis participants, each form containing common items as well as some items that related specifically to the use of videotape or audiotape for the presentation of teaching samples for analysis purposes.

Measurement

Measurement Problems

Two problems of measurement arose in the study, both of which were outcomes of the emphasis in the microteaching and observation-analysis treatments on sensitisation to a skills repertoire, rather than on merely increasing frequency of use for particular skills.

Problem 1: Measuring the Logical Function of Questions

This problem concerned identification of the criterion by which to measure any effects of experimental treatments on subjects' use of low, middle and high order initial and probing questions. Because the microteaching and observation-analysis treatments

stressed that all skills could be appropriate on occasion, no hierarchy of teaching effectiveness for these levels of questions could be assumed. Nor could it be assumed that all three of these question levels should, of necessity, be used in every group discussion lesson, or that high frequency of use of low order questions necessarily denoted ineffective teaching. Consequently, some criterion was needed in order to assess whether or not low, middle and high order questions were being used effectively.

The problem was solved by operationally defining teaching effectiveness as repertoire control in relation to a prescribed set of teaching goals, the emphasis for which was on pupil thinking rather than remembering. Thus, for the pre-test and post-test discussion lessons based on story stimulus material, the standard direction given to subjects was: "While it would be appropriate at certain points in the discussion to use memory-recall questions, most of your attention should be directed towards getting the pupils thinking about the content of the story" (underlining as occurred on the directions sheet issued). Accompanying this general direction was a list of middle and high order question types described in terms of the thinking processes they were intended to elicit, e.g., understanding, interpreting, reasoning, analysing, judging and problem-solving (see Appendices A.2 and A.6: p.359 and p.372). Thus, the measurement criterion became the way in which subjects used their repertoire of cognitive questions to achieve specified teaching goals, namely, predominance for middle and high order thinking. There was an assumption made here, of course, that a reciprocal relationship would exist during teaching between the level of teacher questioning and the level of pupil thinking.

In this context it might at first appear that the higher the frequency of middle and high order questions, the more effective would be the repertoire control. However, observations during a pilot study with an in-service microteaching programme suggested that this is not necessarily the case (Freyberg *et al.*, 1974). This study revealed that, pre-test to post-test, participants tended to reduce rather than increase the number of high order initial questions asked, and spent longer time sustaining discussion episodes related to these questions. It appeared that the quality

of initial questions had changed: they elicited longer and substantively richer pupil responses which, in turn, placed limitations on teacher opportunity to ask subsequent questions.

These observations suggested that a misleading picture could arise if the measure of repertoire control were merely frequency of occurrence for different levels of questioning. It was decided, therefore, that a significant and more accurate measure was the proportion rather than simply the frequency of questions at levels which matched the prescribed teaching goals, namely, middle and high order thinking. This approach ensured that no subject would be placed at a disadvantage to other subjects and be penalised in measurement because of less opportunity to ask questions. At the same time, it provided information concerning each subject's tendency to meet or not meet the prescribed teaching goals. To be consistent, similar ratio type measures were developed with reference to pupil response patterns.

Problem 2: Measuring Sequence Patterns for Teacher and Pupil Verbal Moves

The sensitisation experience in microteaching and observation-analysis not only involved alternative ways of using individual skills, but also different patterns for sequencing groups of skills. Two kinds of patterning were of interest: (i) Variation in overall teaching strategy, the critical sequence here being the discussion lesson episode, and (ii) variation in sequence patterns for tactics (skills) within discussion lesson episodes (compare the discussion in Chapter 2 on strategy and tactics in the teaching process). Once again, however, there could be no assumption in a sensitisation model of microteaching that certain sequence patterns were necessarily superior to others for increasing pupil achievement.

This posed once more the problem of identifying a criterion by which to judge the effects of experimental treatments on subjects' handling of different sequence possibilities for verbal interaction. The measures finally developed were crude instruments which reflect the investigator's groping in a field which is nascent in research of the descriptive-survey type, let alone in experimental studies

(c.f., Dunkin and Biddle, 1974). In fact, the measures developed do not relate to sequential patterns so much as they do to tendencies to use certain skills and groups of related skills, both of which were assessed by means of ratio scores. For example, sustaining tendency (which concerns inclination to explore the substantive focus of an episode by redirecting questions, probing responses, using pupil ideas and returning pupil questions to pupils) was measured by expressing the number of these teacher moves taken together as a ratio of the total questions asked (see below).

The Measures

The following measures were derived to help determine the effects of different treatments in the study on student performance on the dependent variables:

CONTROL FUNCTIONS OF TEACHER QUESTIONS

1. Fluency-control. Ratio of active substantive-logical questions to total questions (NOTE: Active = total questions minus the following questions: affective, procedural, rhetorical, exhortatory, repeated, abortive, false-starting, and attached prompts).

$$\frac{\text{Active SLQ}}{\text{Total Q}}$$

2. Cognitive episode control. Total episodes minus those initiated by affective questions.

$$\text{Total ep.} - \text{ep.}^{\text{affec.}}$$

3. Episode sustaining tendency. Ratio of sustaining questions (redirection, probing, probe-redirecting, using pupil ideas, returning pupil questions to pupils) to total substantive-logical episodes.

$$\frac{\text{SLSQ}}{\text{Total SL ep}}$$

4. Redirection tendency. Ratio of substantive-logical redirection and probe-redirection questions to total substantive-logical questions.

$$\frac{\text{R + PR SLQ}}{\text{Total SLQ}}$$

5. Probing tendency. Ratio of substantive-logical probing questions to total substantive-logical questions.

$$\frac{\text{PSLQ}}{\text{Total SLQ}}$$

6. Tendency to use pupil ideas. Ratio of substantive-logical questions and statements using pupil ideas to total pupil answers, answer-initiations and reactive initiations.

$$\frac{U^{Q} + U^{st} + Ac^{para}}{\text{Total A + AI + I}}$$

7. Structuring tendency. Ratio of substantive and procedural structuring moves with initial and sustaining questions to total substantive-logical questions.

$$\frac{\text{S and SS}^{sub/proc}}{\text{Total SLQ}}$$

LOGICAL FUNCTIONS OF TEACHER QUESTIONS

8. Low order initial questioning. Ratio of low order initial questions to total substantive-logical initial questions.

$$\frac{\text{LOIQ}}{\text{Total SLIQ}}$$

9. Middle order initial questioning. Ratio of middle order initial questions to total substantive-logical initial questions.

$$\frac{\text{MOIQ}}{\text{Total SLIQ}}$$

10. High order initial questioning. Ratio of high order initial questions to total substantive-logical initial questions.

$$\frac{\text{HOIQ}}{\text{Total SLIQ}}$$

11. High order probing. Ratio of high order probing questions (critical awareness and refocusing) to total substantive-logical probing questions.

$$\frac{\text{HOPQ}}{\text{Total SLPQ}}$$

TEACHER-PUPIL TALK PATTERNS

12. Amount of teacher talk. Ratio of teacher talk-time to total teacher and pupil talk time.

$$\frac{\text{T talk-time}}{\text{Total T + P talk-time}}$$

13. Repetition of pupil responses. Ratio of repeated pupil responses to total pupil answers, answer-initiations and reactive initiations.

$$\frac{Ac^{rep}}{\text{Total A + AI + I}}$$

14. Asking Yes/No questions. Ratio of yes/no questions to total substantive-logical questions.

$$\frac{\text{Y/N}}{\text{Total SLQ}}$$

15. Answering own questions. Ratio of own questions answered to total active and abortive substantive-logical questions.

$$\frac{\text{AOQ}}{\text{Total act/ab SLQ}}$$

16. One idea pupil responding. Ratio of one idea responses (excluding yes/no) to total one, several and extended ideas pupil responses.

$$\frac{A^{1} + AI^{1} + I^{1}}{\text{Total p. responses}}$$

17. Several ideas pupil responding. Ratio of several ideas responses to total one, several and extended ideas pupil responses.

$$\frac{A^{2/3} + AI^{2/3} + I^{2/3}}{\text{Total p. responses}}$$

18. Extended ideas pupil responding. Ratio of extended ideas responses to total one, several and extended ideas pupil responses.

$$\frac{A^{4^{+}} + AI^{4^{+}} + I^{4^{+}}}{\text{Total p. responses}}$$

19. Coordinate-reactive pupil responding. Ratio of answer-initiation and reactive initiations to total pupil responses.

$$\frac{AI + I}{\text{Total p. responses}}$$

Statistical Procedures

Treatment Effects on Questioning Skills and Talk Patterns

The statistical analysis of changes in these dependent variables proceeded in three stages which paralleled Parts 1-3 of the overall research design. The sequence of decisions to test for differential and overall effects of treatments may be illustrated as follows.

Differential Treatment Effects

In keeping with the recommendations of Lord (1963) and Cronbach and Furby (1970), estimation and comparison of the pre- to post-test effects of different treatments on the dependent variables were not based on mean raw score gains or losses. These could lead to distorted or fallacious conclusions because of regression effects and the systematic relationship of change scores to any random error of measurement. In the present study, therefore, null hypotheses that treatments in the Parts 1-3 research designs had the same effect were tested using the following common set of procedures:

1. MANOVA on pre-test performance. A multivariate analysis of variance was conducted on pre-test performance related to all dependent variables taken together. The computer programme for MANOVA by Cooley and Lohnes (1971) was used for the Parts 1 and 2

designs, while the Part 3 design necessitated use of the BMD12V computer programme for MANOVA (Dixon, 1973). Depending on the result of this MANOVA, one of two alternative sets of procedures was followed: either Procedure 2 or Procedure 3 below.

2. Pre-test MANOVA indicating no significant different between groups. Where this result occurred, a further MANOVA was carried out on post-test performance similar to that described above:

   (a) If this MANOVA showed no significant difference between groups, the null hypothesis that treatments had the same effect was accepted.

   (b) If this MANOVA showed significant difference between groups, a series of univariate ANOVAS on the dependent variables was conducted for the Parts 1 and 2 research designs, while analysis for the Part 3 design involved a series of factorial ANOVAS. The computer programme used for both types of analysis of variance was TEDDYBEAR (Wilson, 1974).

   (c) In the case of significant F ratios being found, *post hoc* comparisons between all pair-wise treatment group means were carried out using Duncan's New Multiple Range test.

   (d) A check on homogeneity of variance was made in the Parts 1 and 2 research designs by means of Barlett's test for unequal numbers of observations in comparison groups (Winer, 1970: pp.95-6), and in the Part 3 design by using the Hartley F_{max} test for equal numbers of observations.

   (e) Estimates of strength of association for the amount of variance on each variable that could be attributable to differences between treatments were made using the Omega test as outlined by Hays (1973: pp.417-19; 484-88; and 512-14).

3. Pre-test MANOVA indicating significant difference between groups. Where this occurred, the most appropriate statistical analysis procedure would have been to conduct a MANCOVA on post-test performance with pre-test performance as the covariate. However, because a computer programme for this

type of analysis was not available to the investigator, various *ad hoc* analysis procedures were employed.

(a) First of all, analyses of variance were carried out for each dependent variable in order to identify the variables for which significant difference between groups occurred. One-way ANOVAS were used for the Parts 1 and 2 research designs, while 2 × 2 × 2 factorial ANOVAS were conducted for the Part 3 design. The computer programme used for both types of analysis of variance was TEDDYBEAR (Wilson, 1974).

(b) Where an F ratio indicated no significant difference between groups related to a given dependent variable, further statistical analysis followed Procedures 2(a) to 2(e) as outlined above.

(c) Where an F ratio indicated significant difference between groups related to a given dependent variable, an ANCOVA was carried out on post-test performance with pre-test performance as the covariate (one-way ANCOVAS for the Parts 1 and 2 research designs, and 2 × 2 × 2 factorial ANCOVAS for the Part 3 design). The computer programme for these analyses was TEDDYBEAR (Wilson, 1974). If an ANCOVA showed no significant difference between groups, the null hypothesis that treatments had the same effect was accepted. In the case of a significant ANCOVA result, the null hypothesis was rejected and *post hoc* comparisons ensued using adjusted mean scores in order to clarify the possible sources of difference as in Procedure 2(c) above. Homogeneity of variance checks were made (see Procedure 2(e) above) while a check was also made on the proportion of the sums of squares accounted for by the regression analysis using the regression analysis of variance provided by the TEDDYBEAR computer programme for ANCOVA.

Overall Effects of Treatments

To test whether different treatments within the Parts 1-3 research designs had any effects at all on pre- to post-test

performance, paired sample t tests related to each dependent variable were carried out using the appropriate SPSS computer programme (Nie *et al.*, 1975: pp.270-71). For each dependent variable, the statistical sequences below concerning differential effects of treatments determined whether these t tests involved pre- and post-test means for each treatment group separately within a research design, or whether the means used were for all treatment groups combined:

1. Conditions for using separate group means

   (a) Sequence: non-significant pre-test MANOVA/significant post-test MANOVA/significant post-test ANOVA.

   (b) Sequence: significant pre-test MANOVA/non-significant pre-test ANOVA/significant post-test ANOVA.

   (c) Sequence: significant pre-test MANOVA/significant pre-test ANOVA/significant ANCOVA on post-test performance with pre-test performance as the covariate.

2. Conditions for using means for treatment groups combined

   (a) Sequence: pre- and post-test MANOVAS both non-significant.

   (b) Sequence: non-significant pre-test MANOVA/significant post-test MANOVA/non-significant post-test ANOVA.

   (c) Sequence: significant pre-test MANOVA/non-significant pre- and post-test ANOVAS.

   (d) Sequence: significant pre-test MANOVA/non-significant pre- and post-test ANOVAS.

   (e) Sequence: significant pre-test MANOVA/significant pre-test ANOVA/non-significant ANCOVA on post-test performance with pre-test performance as the covariate.

FIGURE 7.5 (p.237) summarises the sequence of decisions on all statistical analyses described in this section that were common to the Parts 1-3 research designs, and which were used to test for differential and overall effects of treatments on dependent variables in the study. It should be noted that only F-values and t-values with $p \leq .05$ were considered to be statistically significant.

Attitudes towards Microteaching and Observation-analysis

Two kinds of measure were obtained for responses to the Likert-type items in the opinion questionnaires administered to microteaching and observation-analysis programme participants. First, the percentage of responses on each of the five scale points in each item was calculated for a treatment group as a whole. Secondly, related to each item a mean response score was obtained for a treatment as a whole, and for a treatment group within this treatment. Mean response scores were derived by assigning a numerical value in the range 1 to 5 to each of the five scale points in an item, the value 5 representing the investigator's assessment of the most favourable response in terms of programme objectives. All measures of response to the opinion questionnaires were obtained using the SPSS computer programme for descriptive statistics (Nie *et al.*, 1975: pp.181-202).

In addition to these statistical measures, comments made by respondents concerning any given questionnaire item were analysed to select a set of representative statements, alongside each of which an entry was made of the number of persons in a treatment group supporting it.

To measure more accurately the attitudes of microteachers towards the general effectiveness of the microteaching experience, as well as any differential attitudes between microteaching groups, responses to statements in Section 1 of the microteaching questionnaire were tested for their scalability with the H-Technique (Edwards, 1957: pp.227-38).

When the application of the H-Technique proved unsuccessful, it was decided to make a factor analysis of responses to all items in Section 1 of the questionnaire, supplemented by one item from Section 3 which referred to the merit of studying one teaching skill at a time in contrast to the cluster of skills approach which had been adopted in the microteaching programme. A number of principal components factor analyses were performed on the 22 items involved, using scores derived from student responses on the 1 to 5 value scale. The computer programme employed was the SPSS Factor Analysis with Varimax Rotation (Nie *et al.*, 1975: pp.468-514). Mean factor scores for microteachers in each of the children-video, children-audio,

peers-video and peers-audio treatments were then derived directly from factor loadings, and were subjected to a multivariate analysis of variance to help determine any significant differences in attitude towards the microteaching experience. The MANOVA computer programme used was the BMD12V (Dixon, 1973).

If this MANOVA showed no significant difference between microteaching treatment groups, the null hypothesis could be accepted that all treatments had the same effects on subjects' attitudes about the effectiveness of microteaching. In the case of a significant MANOVA result, possible sources of difference in attitude could be identified by means of appropriate comparison tests.

CHAPTER 8

RESULTS AND DISCUSSION

OUTLINE: Findings on student teachers' questioning skills and talk patterns are reported in relation to Parts 1-3 respectively of the overall research design. Within the section devoted to each of these parts, the research results are given first for the overall effects of treatments (pre-test to post-test), and then for the differential effects of treatments. The analysis of results in each section includes formal rejection or acceptance of the relevant null hypothesis and is followed by discussion of the experimental findings. In the final section of the chapter, results are reported on the attitudes of microteaching and observation-analysis participants towards their respective programmes.

The Results — Part 1 Research Design

The first major hypothesis in the study concerned the overall and differential effects of microteaching, observation-analysis and no-treatment on the pre- to post-test performance of student teachers on nineteen questioning skills and talk patterns.

Hypothesis 1.1 stated that student teachers in these three treatment groups would make no significant changes in their teaching performance between a pre- and post-test lesson.

Hypothesis 1.2 stated that there would be no significant differences between these three treatments in the effects that they had on pre- to post-test teaching performance.

The experimental results are presented below, first, for the overall effects of treatments, and then for their differential effects.

Overall Effects of Treatments

TABLE 8.3 (p.240) provides a summary of the results for the paired sample t tests (2-tailed) that were carried out on the pre- to

post-test performance of the three treatment groups related to the nineteen dependent variables in the study. Details of these tests are given in TABLES 8.4-8.6 (pp.241-243). The pre- to post-test performance of all treatment groups is shown in graph form in FIGURE 8.1 (p.244).

As can be seen in TABLE 8.3, t tests related to seven of the dependent variables involved pre- and post-test means for the three treatment groups combined: Variables 4, 6, 7, 9, 16, 17 and 18. This followed the procedure outlined at the end of Chapter 7 for use in cases where no significant differences were found between the effects of treatments on either pre- or post-test performance.

Microteaching treatment (TABLES 8.3 and 8.4)

Microteachers made significant shifts in pre- to post-test performance on the sixteen teaching variables listed below. For these sixteen variables, therefore, Hypothesis 1.1 that there would be no significant changes in teaching performance was rejected:

CONTROL FUNCTIONS OF QUESTIONS		
1.	Fluency-control ($p \leq .001$)	Increase
2.	Cognitive episode control ($p \leq .001$)	Increase
3.	Episode sustaining tendency ($p \leq .001$)	Increase
5.	Probing tendency ($p \leq .001$)	Increase
7.	Structuring with questions ($p \leq .02$)	Increase
LOGICAL FUNCTIONS OF QUESTIONS		
8.	Low order initial questioning ($p \leq .001$)	Decrease
9.	Middle order initial questioning ($p \leq .001$)	Increase
10.	High order initial questioning ($p \leq .001$)	Increase
11.	High order probing ($p \leq .001$)	Increase
TEACHER-PUPIL TALK PATTERNS		
12.	Amount of teacher talk-time ($p \leq .001$)	Decrease
13.	Repetition of pupil responses ($p \leq .001$)	Decrease
15.	Answering own questions ($p \leq .003$)	Decrease
16.	One idea pupil responses ($p \leq .001$)	Decrease
17.	Several ideas pupil responses ($p \leq .001$)	Increase
18.	Extended ideas pupil responses ($p \leq .001$)	Increase
19.	Coordinate-reactive pupil responding ($p \leq .001$)	Increase

TABLE 8.3 also shows that microteachers made no significant changes in their teaching behaviour on the following three variables. On these variables, therefore, Hypothesis 1.1 was accepted.

CONTROL FUNCTIONS OF QUESTIONS

4. Redirection of questions.
8. Using pupil ideas.

TEACHER-PUPIL TALK PATTERNS

14. Asking yes/no questions.

Observation-analysis treatment (TABLES 8.3 and 8.5)

This treatment resulted in eleven significant changes in pre- to post-test performance, ten of which matched the directions for change indicated above for microteaching. The eleventh change concerned the asking of yes/no questions (Variable 14) which, contrary to programme objectives, showed a significant increase. For the observation-analysis treatment group, therefore, Hypothesis 1.1 was rejected on the following teaching variables:

CONTROL FUNCTIONS OF QUESTIONS

1.	Fluency-control ($p \leq .001$)	Increase
7.	Structuring with questions ($p \leq .02$)	Increase

LOGICAL FUNCTIONS OF QUESTIONS

8.	Low order initial questioning ($p \leq .001$)	Decrease
9.	Middle order initial questioning ($p \leq .001$)	Increase
10.	High order initial questioning ($p \leq .002$)	Increase
11.	High order probing ($p \leq .025$)	Increase

TEACHER-PUPIL TALK PATTERNS

14.	Asking yes/no questions ($p \leq .008$)	Increase
16.	One idea pupil responses ($p \leq .001$)	Decrease
17.	Several ideas pupil responses ($p \leq .001$)	Increase
18.	Extended ideas pupil responses ($p \leq .001$)	Increase
19.	Coordinate-reactive pupil responding ($p \leq .029$)	Increase

TABLE 8.3 also shows that observation-analysis participants made no significant changes in their teaching behaviour on the following eight variables. For these variables, therefore, Hypothesis 1.1 was accepted:

CONTROL FUNCTIONS OF QUESTIONS

2. Cognitive episode control.
3. Episode sustaining tendency.
4. Redirection of questions.
5. Probing tendency.
6. Use of pupil ideas.

TEACHER-PUPIL TALK PATTERNS

12. Amount of teacher talk-time.
13. Repetition of pupil responses.
15. Answering own questions.

A comparison of the data in TABLES 8.5 and 8.4 reveals that of the non-significant changes above, performance on Variables 2, 3, 5, 12 and 13 was slightly in the direction of changes made by micro-teachers, while performance on Variable 15 showed a marginal increase which was contrary to the programme objectives for both microteaching and observation-analysis.

No-treatment (TABLES 8.3 and 8.6)

Members of the no-treatment group made significant changes in pre- to post-test performance on seven teaching variables, all but one of which (Variable 15, answering own questions) matched the direction of change achieved by microteachers. For these seven variables, Hypothesis 1.1 was thus rejected:

CONTROL FUNCTIONS OF QUESTIONS

7. Structuring with questions ($p \leq .02$) Increase

LOGICAL FUNCTIONS OF QUESTIONS

8. Low order initial questioning ($p \leq .002$) Decrease
9. Middle order initial questioning ($p \leq .001$) Increase

TEACHER-PUPIL TALK PATTERNS

15. Answering own questions ($p \leq .046$) Increase
16. One idea pupil responses ($p \leq .001$) Decrease
17. Several ideas pupil responses ($p \leq .001$) Increase
18. Extended ideas pupil responses ($p \leq .001$) Increase

TABLE 8.3 also shows that the no-treatment group made no significant changes on twelve teaching variables. For these variables, Hypothesis 1.1 was thus accepted:

CONTROL FUNCTIONS OF QUESTIONS

1. Fluency-control.
2. Cognitive episode control.
3. Episode sustaining tendency.
4. Redirection of questions.
5. Probing tendency.
6. Use of pupil ideas.

LOGICAL FUNCTIONS OF QUESTIONS

10. High order initial questioning.
11. High order probing.

TEACHER-PUPIL TALK PATTERNS

12. Amount of teacher talk-time.
13. Repetition of pupil responses.
14. Asking yes/no questions.
19. Coordinate-reactive pupil responding.

A comparison of the data in TABLES 8.6 and 8.4 shows that of these non-significant changes above, performance on Variables 1, 10, 11, 12 and 13 was slightly or marginally in the direction of changes made by microteachers, while change on Variables 2, 3, 5, and 14 was actually in a counter-direction.

Greatest and least amount of significant change within groups

As can be seen in TABLE 8.4, five teaching behaviours stood out among microteachers as changing more than any others between pre- and post-test teaching. These included substantial reductions in low order initial questioning and in the number of cognitive episodes in discussion lessons (Variables 8 and 2), as well as increases in the number of sustaining questions that were used per episode, high order initial questioning, and high order probing (Variables 3, 10 and 11).

In the observation-analysis and no-treatment groups, the data in TABLES 8.5 and 8.6 indicate that the largest shifts in pre- to post-test teaching behaviour were in the smaller proportion of low order questions in all initial questions asked (Variable 8), and in the increase for the proportion of middle order questions (Variable 9). In addition, the observation-analysis group made

fairly substantial gains in the use of high order initial questions (Variable 10).

Across all three treatment groups, TABLES 8.4-8.6 show that the least amount of significant change occurred in the degree to which questions were accompanied by structuring moves (Variable 7), in answering one's own questions (Variable 15), and in altering the proportions for one idea, several ideas, and extended ideas pupil responding (Variables 16, 17 and 18).

Summary

Microteachers made significant shifts in pre- to post-test teaching performance on sixteen of the nineteen dependent variables in the study. In the light of directions given to student teachers for their pre- and post-test lessons — to use questioning skills to help pupils think about ideas in a story rather than to remember factual details — these changes show that microteachers were able to control a repertoire of skills in ways that were appropriate to a particular teaching objective. This kind of control was a major objective of the sensitisation experience in microteaching. The observation-analysis group made significant changes on eleven of the dependent measures, all but one of which (asking yes/no questions) were in directions similar to those achieved by microteachers. Of the seven significant performance changes made by members of the no-treatment group, six matched directions encouraged by the microteaching and observation-analysis programmes in the study.

Differential Effects of Treatments

To ascertain whether or not there were any significant differences in the effects of microteaching, observation-analysis and no-treatment on the nineteen dependent variables in the Part 1 research design, a MANOVA was conducted first of all on pre-test performance. When this proved to be non-significant, a further MANOVA was carried out on post-test performance which was significant at the .01 level (TABLES 8.1 and 8.2: pp.238-239). Hypothesis 1.2, that there would be no significant differential effects for treatments in the Part 1 research design, was then tested by a series of one-way ANOVAS related to post-test performance

on the dependent variables and, where significant F-ratios resulted, by making *post hoc* comparisons between all pair-wise treatment group means using Duncan's New Multiple Range test. The analyses are given in summary form in TABLE 8.3 (p.240) and are detailed in TABLE 8.7 (pp.245-263).

As can be seen in TABLE 8.3, the ANOVAS on post-test teaching performance indicated highly significant differences in the amount of change caused by treatments on the twelve variables listed below. For these twelve variables, therefore, the hypothesis of no significant differential effects was rejected.

CONTROL FUNCTIONS OF QUESTIONS

1. Fluency-control ($p \leq .001$).
2. Cognitive episode control ($p \leq .001$).
3. Episode sustaining tendency ($p \leq .003$).
5. Probing tendency ($p \leq .005$).

LOGICAL FUNCTIONS OF QUESTIONS

8. Low order initial questioning ($p \leq .001$).
10. High order initial questioning ($p \leq .001$).
11. High order probing ($p \leq .001$).

TEACHER-PUPIL TALK PATTERNS

12. Amount of teacher talk ($p \leq .001$).
13. Repetition of pupil responses ($p \leq .001$).
14. Asking yes/no questions ($p \leq .001$).
15. Answering own questions ($p \leq .001$).
19. Coordinate-reactive pupil responding ($p \leq .01$).

TABLE 8.3 also shows that there were no significant differential effects for treatments on seven dependent variables. For these variables, therefore, Hypothesis 1.2 in the study was accepted:

CONTROL FUNCTIONS OF QUESTIONS

4. Redirection of questions.
6. Using pupil ideas.
7. Structuring with questions.

LOGICAL FUNCTIONS OF QUESTIONS

9. Middle order initial questioning.

TEACHER-PUPIL TALK PATTERNS

16. One idea pupil responses.

17. Several ideas pupil responses.

18. Extended ideas pupil responses. (On this variable, the F-ratio for the post-test ANOVA almost reached the .05 level of significance.)

For the twelve variables showing significant treatment differences, the effects were clarified by means of Duncan's New Multiple Range test. The results for the comparisons among treatment group means are outlined below:

Post hoc comparisons: control functions of questions

(TABLES 8.3 and 8.7)

Variable 1: FLUENCY-CONTROL IN QUESTIONING. For increasing fluency control, microteaching was significantly superior to both observation-analysis ($p \leq .05$) and no-treatment ($p \leq .01$), while observation-analysis was significantly superior to no-treatment ($p \leq .01$).

Variable 2: COGNITIVE EPISODE CONTROL. The pattern of significant differential effects for treatments on this variable was the same as that for Variable 1 above. Microteachers created significantly fewer cognitive episodes in post-test lessons than did either the observation-analysis or no-treatment groups ($p \leq .01$), while observation analysis participants created fewer episodes than members of the no-treatment group ($p \leq .01$). TABLE 8.7 (2) shows, however, that homogeneity of variance among treatment groups could not be accepted on this variable (Bartlett's test).

Variable 3: EPISODE SUSTAINING TENDENCY. Microteachers asked significantly more sustaining questions per discussion lesson episode than did observation-analysis participants ($p \leq .05$) or members of the no-treatment group ($p \leq .01$), there being no significant difference in the performances of the two latter groups.

Variable 5: PROBING TENDENCY. For increasing the proportion of probing questions in all questions asked, microteaching

was significantly superior to observation-analysis ($p \leq .05$) and to no-treatment ($p \leq .01$). There was no significant difference in the effects of these two latter groups.

Post hoc comparisons: logical functions of questions

(TABLES 8.3 and 8.7)

Variable 8: LOW ORDER INITIAL QUESTIONING. Microteachers emitted a significantly smaller proportion of low order questions in all questions asked than did either the observation-analysis or no-treatment group ($p \leq .01$). In the same direction, observation-analysis was superior to no-treatment ($p \leq .05$).

Variable 10: HIGH ORDER INITIAL QUESTIONING. For increasing the proportion of high order questions in all initial questions asked, microteaching was significantly superior to both observation-analysis and no-treatment ($p \leq .01$). There was no significant different in the effects of these two latter treatments.

Variable 11: HIGH ORDER PROBING. The pattern of differential effects for treatments on this variable was the same as that for Variable 10 above. For helping student teachers increase the extent to which they probe pupil responses for higher level thinking, microteaching was significantly superior to both observation-analysis and no-treatment ($p \leq .01$). There was no significant difference in the effects of observation-analysis and no-treatment.

Post hoc comparisons: teacher-pupil talk patterns

(TABLES 8.3 and 8.7)

Variable 12: AMOUNT OF TEACHER TALK. For reducing teacher talk-time, the analysis of between-group differences indicated that microteaching was significantly more effective than observation-analysis ($p \leq .05$) and no-treatment ($p \leq .01$). There was no significant difference between

the effects of these two latter treatments.

Variable 13: REPETITION OF PUPIL RESPONSES. For reducing this tendency, microteaching and observation-analysis were both significantly more effective than no-treatment ($p \leq .01$) and $p \leq .05$ respectively), but not significantly more effective than each other. Nevertheless, TABLE 8.7 (13) shows that homogeneity of variance among treatment groups could not be accepted on this variable (Bartlett's test).

Variable 14: ASKING YES/NO QUESTIONS. For minimising the asking of yes/no questions, microteaching was significantly superior to both observation-analysis and no-treatment ($p \leq .01$) between which there was no significant difference in effects.

Variable 15: ANSWERING OWN QUESTIONS. On this variable only one significant difference between treatments was identified: microteaching was significantly superior to no-treatment ($p \leq .01$). As TABLE 8.7 (15) shows, however, the findings on this variable need to be qualified in two respects: first, homogeneity of variance among treatment groups could not be accepted (Bartlett's test); secondly, the incidence of answering one's own questions was so low in the post-test lessons of all groups that even a small mean difference could bring about a statistically significant but, in real terms, not very important result.

Variable 19: COORDINATE-REACTIVE PUPIL RESPONDING. Only one significant result was obtained for this variable. Microteaching was significantly superior to no-treatment ($p \leq .01$) in encouraging coordinate reactive responding by pupils.

Summary

Highly significant F-ratios were obtained for twelve of the ANOVAS carried out on the post-test performance of the microteaching,

observation-analysis and no-treatment groups on the nineteen dependent variables in the study. One of these results — that for Variable 15, answering one's own questions — is of doubtful value because the behaviour occurred so seldom in all treatment groups that a slight mean difference could bring about a statistically significant but not very meaningful outcome. In addition, homogeneity of variance among groups was not evident in the case of Variables 2, 3, 13 and 15. Recognising these features of the analyses, the results in the Part 1 research design concerning differential effects for treatments may be summarised as follows:

(i) Microteachers performed significantly better than observation-analysis participants on nine teaching variables:

1. Fluency-control in questioning.
2. Cognitive episode control.
3. Episode sustaining tendency.
5. Probing tendency.
8. Reducing low order initial questioning.
10. Increasing high order initial questioning.
11. Increasing high order probing.
12. Decreasing teacher talk-time.
14. Decreasing yes/no questioning.

(ii) There was no significant difference in the performance of microteachers and observation-analysis participants on the following three teaching variables:

13. Repetition of pupil responses.
15. Answering own questions.
19. Coordinate-reactive pupil responding.

(iii) Microteachers performed significantly better than members of the no-treatment group in all twelve of the teaching variables mentioned in (i) and (ii) above.

(iv) Observation-analysis participants were significantly superior to members of the no-treatment group on four teaching variables:

1. Fluency-control in questioning.
2. Cognitive episode control.
8. Reducing low order initial questioning.
13. Reducing repetition of pupil responses.

(v) There were no significant differences in the effects of microteaching, observation-analysis and no-treatment on the

following teaching variables:

4. Redirecting questions.
6. Use of pupil ideas.
7. Structuring with questions.
9. Asking middle order questions.
16. Stimulating one idea pupil responses.
17. Stimulating several ideas pupil responses.
18. Stimulating extended ideas pupil responses.

Discussion of the Results

The general direction given for pre- and post-test teaching was to use questioning skills so that pupils would be encouraged to think about ideas in a story rather than to merely recall the factual details it contained. For helping student teachers control a repertoire of questioning skills in ways appropriate to this cognitive objective, the results reported above suggest general superiority for microteaching over observation-analysis and regular coursework in professional studies (no-treatment). This finding is discussed below for each of the three categories of dependent variables used in the study.

Control functions of questions. Microteachers made significant changes in pre- to post-test performance on five of the variables in this category for teacher questioning, and on four of these were significantly superior to members of the observation-analysis and no-treatment groups: they exhibited greater fluency-control in questioning and stimulated far fewer but "longer-riding" discussion episodes because of their greater tendency to ask sustaining questions, in particular those of a probing kind.[1] While the observation-analysis treatment significantly improved fluency-control in questioning, it was not as effective in this regard as micro-teaching. It is interesting to note that, on three of the four variables mentioned above, non-significant changes by the no-treatment group were actually in a counter-direction to those achieved by microteachers: post-test lessons continued to contain

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1 For the amount of variance on each of these variables that could be attributable to differences between treatments, the Omega statistic in TABLE 8.3 (p.240) shows that strength of association was greatest for fluency-control ($\omega^2 = .26$) and cognitive episode control ($\omega^2 = .30$).

the large number of episodes evident in pre-test teaching, while the tendency to use sustaining questions (including probing) was somewhat reduced.

That all three treatments resulted in the same amount of significant, but nevertheless minimal, change in structuring with questions is probably not of much educational import. The tendency to set the stage for questions by accompanying them with substantive and/or procedural information is a fairly common social skill. It is unlikely, therefore, that microteaching would have provided any special advantages over the other two treatments concerning this behaviour.

Somewhat surprisingly, the results show no significant overall or differential effects for treatments regarding the redirection of questions. However, the performance of subjects on other dependent variables suggests some possible reasons why this was so. In the first place, because both microteaching and observation-analysis participants significantly increased coordinate-reactive pupil responding, it seems reasonable to assume that they tended to underplay the redirection of questions, preferring to use the skill of wait-time in order to encourage voluntary responses and pupil-to-pupil dialogue. Again, the finding that only microteachers significantly increased probing tendency suggests that this kind of verbal move was preferred to redirecting questions. In addition, it might be argued that formal redirection of questions is less likely to be necessary within the intimate setting of small group teaching, than it is when working with a whole class or large group. Finally, and notwithstanding these preceding explanations, it is also possible that performance shifts in the redirection of questions were actually made, but that these were of a non-verbal kind (e.g., head nods, eye-to-eye signals). This being so, such changes could not be identified on the audiotapes from which lessons were transcribed for analysis and measurement purposes.

It is also interesting to note that microteaching was no more effective than the other two treatments in promoting the skill of using pupil ideas (e.g., making statements and asking questions to draw together the threads of discussion for an episode, or for a lesson as a whole). In fact, this skill occurred very seldom in the

pre- and post-test lessons of any of the treatment groups. At least three reasons may lie behind the findings. The first is that the ten-minute period for criterion lessons may have been too short to allow this skill to be used unless it were artificially "forced". It could also be, of course, that the skill of using pupil ideas is a difficult one to manage — an opinion often expressed by micro-teachers during their feedback sessions. Thirdly, however, the results on this skill may be partially an artifact of the SQUAIES coding system which was used to analyse lesson transcripts. While SQUAIES classifies the use of pupil ideas as sustaining or terminal moves within the episode framework, an inspection of the transcripts for post-test teaching revealed that episodes were sometimes introduced with a question that served to draw ideas together from preceding episodes (e.g., an evaluation question). Such questions were regarded as initial questions only and, consonant with the ground rules for SQUAIES, were coded according to their substantive-logical intent.

Logical functions of questions. For developing control of different levels of questioning to meet particular teaching objectives — in the present study, higher level pupil thinking — once again the results for the Part 1 research design indicate general superiority for microteaching over the other two treatments.

In the pre-test situation, approximately two-thirds of the initial questions asked by all treatment groups were of a low order variety. Thus, despite preceding coursework on different levels of questioning,[2] it appears that students had difficulty in implementing a questioning strategy that was appropriate for specific teaching purposes. While this picture changed significantly for all treatment groups in post-test lessons, the magnitude of change was greatest by far in the microteaching group: only one-fifth of microteachers' initial questions were of a low order, whereas the proportions for the observation-analysis and no-treatment groups were one-third and one-half respectively. In addition, even though microteaching and observation-analysis participants both significantly increased the

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2 This concerned professional studies in Learning and Teaching, Teaching of Language and Teaching of Mathematics.

proportions for high order initial and probing questions, microteachers made greater shifts. No significant differences were evident for the effects of observation-analysis and no-treatment on these same two skills. The Omega statistic in TABLE 8.3 (p.240) indicates fairly high level of association between differential effects for treatments and the amount of variance on these three variables: low order initial questioning ($\omega^2 = .28$); high order initial questioning ($\omega^2 = .38$); and high order probing ($\omega^2 = .16$).

With regard to the superiority of microteachers in high order initial questioning, it should be noted that the level of interjudge reliability for coding this skill in post-test lessons was nowhere near as high as the level obtained for the pre-test analyses (see TABLE 7.3: p.236). On this variable, therefore rejection of the null hypothesis that treatments had equal effects had to be carefully checked for the possibility of a Type 1 error. Specifically, results favouring microteaching may have been due to the inaccurate coding of high order questions as middle order questions in the case of the observation-analysis and no-treatment groups. Alternatively, coding errors may have led to the finding that treatments were equally effective in their influence on middle order questioning.

Two lines of evidence suggest that a Type 1 error had not been made. First, the magnitude of increase on high order initial questioning by microteachers was so large in comparison with that achieved by the other two groups that the likelihood of a systematic effect for coding inaccuracies seems fairly remote. Secondly, however, the investigator's re-coding of initial questions in all post-test lessons resulted in very few modifications to question levels — certainly not enough to significantly alter the pattern of overall and differential effects for treatments. It appears, therefore, that the interjudge reliability problem for coding high order initial questions was confined predominantly to those post-test lesson transcripts that were randomly chosen for the purpose of reliability checks.

An especially interesting feature of the results for the logical functions of questions is the finding that no-treatment led to significant changes in the proportions for low and middle order initial questioning. This suggests that there were systematic

effects on teaching performance as a result of the Year 2 school practice experience that followed pre-testing and/or the professional studies courses in Year 3 that immediately preceded post-testing. As such, it is likely that these experiences also contributed to the variance between pre- and post-test performance on these same skills that was evidenced by the microteaching and observation-analysis groups. Nevertheless, differential effects favouring these two treatments over no-treatment indicate that their special learning provisions "did make a difference".

Teacher-pupil talk patterns. That microteachers were the only students to significantly reduce teacher talk-time is an interesting result because this was not an explicit objective of the microteaching programme. The finding appears to be explained by microteachers' handling of other talk patterns, as well as the control functions of questions discussed above. For example, microteachers were generally more successful than members of the other two treatment groups in avoiding habitual repetition of pupil responses, asking questions that simply call for yes/no answers, and answering their own questions, albeit that the incidence of the latter behaviour was so low across all groups that a statistically significant result has little meaning in real terms. These teacher behaviours not only tend to interrupt discussion flow, but also increase unnecessarily the amount of time occupied in a lesson by teacher talk.

Again, apparently as a result of using the skill of wait-time, microteachers encouraged a significant increase in the proportion of pupil responses that were of a coordinate-reactive type (voluntary statements and pupil-to-pupil verbal interaction). Moreover, as mentioned earlier, microteachers were significantly superior to other students in sustaining episodes with questions, so that pupils might discuss a sub-topic at greater length. Taken together, then, these teaching tendencies probably resulted in the pupils of microteachers rather than microteachers themselves, dominating the amount of talk-time.

In contrast, however, there are no obvious reasons why all three treatments produced the same amount of change in the proportions for pupil responses containing one, several and extended numbers of substantive ideas. The results favouring microteachers

in respect of high order questioning and coordinate-reactive pupil responding would seem to suggest that their pupils ought to have made significantly more several ideas and extended ideas responses than pupils of students in the other treatment groups.[3] Perhaps, however, there is no necessary correlation between the cognitive level of a question and the number of substantive ideas that it elicits. Or the results obtained may be an artifact of the subject matter in the stories that were chosen for pre- and post-testing purposes. Yet again, the results may reflect the operation of pupil variables or chance factors which were not under adequate experimental control, or simply the crudeness of the extended ideas response category.

To summarise, the results for the Part 1 research design indicate that microteaching was generally far more effective than either observation-analysis or no-treatment in helping student teachers establish questioning strategy and talk patterns that were appropriate for a prescribed teaching objective of higher level thinking by pupils. In this same direction, observation-analysis had significant overall effects on just over half of the dependent measures taken, but was superior to no-treatment on several of these variables only. Thus, it can be fairly said that observation analysis was not really much more influential on teaching performance than was regular coursework in professional studies.

In considering these findings, it should be recognised that microteaching in the Part 1 research design comprised several distinct sub-treatments. The relationship between the effectiveness of these sub-treatments and microteaching as a whole was explored via the Parts 2 and 3 research designs, and is reported in the sections that follow.

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3 It should be noted that the post-test ANOVA on Variable 18 (extended ideas pupil responding) almost reached significance level ($p = .06$) and that, at this level, the mean performance of the microteaching group ($\bar{x} = .16$) was greater than that found for observation-analysis ($\bar{x} = .12$) and no-treatment ($\bar{x} = .10$). See TABLE 8.7 (18), p.262.

The Results — Part 2 Research Design

The microteaching and observation-analysis treatments in the study each comprised two sub-treatments involving either videotape or audiotape for the presentation of teaching samples and, in the case of microteaching, for replaying microlessons as a source of feedback. Thus the second major hypothesis in the study concerned the overall and differential effects of these four sub-treatments, together with no-treatment, on pre- to post-test performances for the same nineteen dependent variables as were measured in the Part 1 research design.

Hypothesis 2.1 stated that student teachers in each of the five treatment groups would make no significant changes in teaching performance between their pre- and post-test lessons.

Hypothesis 2.2 stated that there would be no significant differences among these five treatments in the effects they had on pre- to post-test teaching performance.

The experimental results are presented below, first for the overall effects of treatments and, secondly, for their differential effects.

Overall Effects of Treatments

TABLE 8.10 (p.266) gives a summary of results for the paired sample t tests (2-tailed) that were conducted on the pre- to post-test performance of the five treatment groups related to the nineteen dependent variables. Details of these tests are reported for each group separately in TABLES 8.11-8.14 (pp.268-271).

As can be seen in TABLE 8.10, t tests related to six of the dependent variables involved pre- and post-test means for all five treatment groups combined. For these variables, either one-way ANOVAS on pre- and post-test performance both showed that there was no significant difference between treatment effects (Variables 4, 6 and 9), or else a significant result for a pre-test ANOVA was followed by a non-significant result for an ANCOVA (Variables 7, 16 and 17).

Media treatments in microteaching (TABLES 8.10 and 8.11-8.12)

Both the video and audio treatment groups in microteaching made performance changes from pre- to post-test that were well beyond the .05 level of significance on the fourteen dependent variables listed below. For these fourteen variables, Hypothesis 2.1 was therefore rejected:

CONTROL FUNCTIONS OF QUESTIONS

1.	Fluency-control	Increase
2.	Cognitive episode control	Increase
3.	Episode sustaining tendency	Increase
5.	Probing tendency	Increase
7.	Structuring with questions	Increase

LOGICAL FUNCTIONS OF QUESTIONS

8.	Low order initial questioning	Decrease
9.	Middle order initial questioning	Increase
10.	High order initial questioning	Increase
11.	High order probing	Increase

TEACHER-PUPIL TALK PATTERNS

12.	Amount of teacher talk-time	Decrease
13.	Repetition of pupil responses	Decrease
16.	One idea pupil responses	Decrease
17.	Several ideas pupil responses	Increase
19.	Coordinate-reactive pupil responding	Increase

In addition, the microteaching-video group made highly significant changes on two variables for which Hypothesis 2.1 was also rejected:

TEACHER-PUPIL TALK PATTERNS

15.	Answering own questions	Decrease
18.	Extended ideas pupil responses	Increase

Neither of the media treatments in microteaching resulted in significant pre- to post-test performance change on the following three teaching variables. For these three variables, therefore, the hypothesis of no significant difference was accepted:

CONTROL FUNCTIONS OF QUESTIONS

4. Redirection of questions.
6. Use of pupil ideas.

TEACHER-PUPIL TALK PATTERNS

14. Asking yes/no questions.

In the case of the audio treatment in microteaching, there was no significant change on two further variables:

TEACHER-PUPIL TALK PATTERNS

15. Answering own questions.

18. Extended ideas pupil responses.

Media treatments in observation-analysis (TABLES 8.10 and 8.13 - 8.14)

Both the video and audio treatment groups in observation analysis made changes in pre- to post-test teaching performance that were well beyond the .05 level of significance on the six variables listed below. For these six variables, therefore, Hypothesis 2.1 was rejected:

CONTROL FUNCTIONS OF QUESTIONS		
1.	Fluency-control	Increase
7.	Structuring with questions	Increase
LOGICAL FUNCTIONS OF QUESTIONS		
8.	Low order initial questioning	Decrease
9.	Middle order initial questioning	Increase
TEACHER-PUPIL TALK PATTERNS		
16.	One idea pupil responses	Decrease
17.	Several ideas pupil responses	Increase

In addition, the audio treatment in observation-analysis resulted in highly significant performance change on four teaching variables. For these four variables Hypothesis 2.1 was also rejected:

CONTROL FUNCTIONS OF QUESTIONS		
2.	Cognitive episode control	Increase
5.	Probing tendency	Increase
LOGICAL FUNCTIONS OF QUESTIONS		
10.	High order initial questioning	Increase
TEACHER-PUPIL TALK PATTERNS		
19.	Coordinate-reactive pupil responding	Increase

Neither of the media treatment groups in observation-analysis

made significant shifts in pre- to post-test teaching performance on the nine variables listed below. On these nine variables, therefore, the hypothesis of no significant difference was accepted:

CONTROL FUNCTIONS OF QUESTIONS

3. Episode sustaining tendency.
4. Redirection of questions.
6. Use of pupil ideas.

LOGICAL FUNCTIONS OF QUESTIONS

11. High order probing.

TEACHER-PUPIL TALK PATTERNS

12. Amount of teacher talk-time.
13. Repetition of pupil responses.
14. Asking yes/no questions.
15. Answering own questions.
18. Extended ideas pupil responses.

In addition, the video treatment in observation-analysis failed to bring about significant change on four teaching variables. For these four variables, therefore, Hypothesis 2.1 was also accepted:

CONTROL FUNCTIONS OF QUESTIONS

2. Cognitive episode control.
5. Probing tendency.

LOGICAL FUNCTIONS OF QUESTIONS

10. High order initial questioning.

TEACHER-PUPIL TALK PATTERNS

19. Coordinate-reactive pupil responding.

No-treatment (TABLES 8.10 and 8.6)

Results in the Part 2 research design for pre- to post-test performance by the no-treatment group were the same as those reported for the Part 1 design (see the previous section). To reiterate briefly, this group made significant behavioural shifts on seven of the nineteen dependent variables in the study. These shifts matched the direction of changes made by the two media treatments in micro-teaching except for the increase on Variable 15 (answering own questions). On this variable, the audio group in microteaching made no significant change at all, while the microteaching-video group

decreased the tendency to use this behaviour (see above).

Greatest and least amount of significant change within groups

A comparison of the data in TABLES 8.11 and 8.12 with that in TABLE 8.4 (pp.268-269, and p.241) indicates that, with the exception of one dependent variable, the video and audio treatments in microteaching made most change in pre- to post-test performance on the same five teaching variables on which the microteaching group as a whole showed greatest change in the Part 1 research design. As before, these changes involved substantial reductions in low order questioning (Variable 8) and in the number of cognitive episodes in lessons (Variable 2), as well as increases in the number of sustaining questions used per episode (Variable 3), high order initial questioning (Variable 10), and high order probing (Variable 11). The exception concerned the audio group's failure to sustain lesson episodes with questions to the same extent as occurred in the video group.

The video and audio treatments in observation-analysis also matched their treatment as a whole in the Part 1 research design concerning greatest amount of significant change (compare TABLES 8.13 and 8.14 with TABLE 8.5, pp.270-271, and p.242). Once again, the changes involved a reduction in low order initial questioning (Variable 8), and increases in middle and high order initial questioning (Variables 9 and 10).

As happened in the Part 1 research design, across all treatment groups the least amount of significant change occurred in structuring with questions (Variable 7), and in altering the proportions for one idea, several ideas, and extended ideas pupil responding (Variables 16, 17 and 18).

Summary

Student teachers in the microteaching-video treatment group made significant changes in pre- to post-test teaching performance on sixteen of the nineteen dependent variables in the study. Those participating in the audio-backed treatment in microteaching matched these changes in fourteen instances. On the same nineteen dependent variables, the video group in observation-analysis made six

significant changes, while the audio group made ten changes. All of these behavioural shifts matched the direction of changes exhibited by the two media treatment groups in microteaching. Of the seven significant changes in pre- to post-test performance achieved by members of the no-treatment group, all but one (answering one's own questions) matched the direction of change revealed by the other four treatment groups in the Part 2 research design.

Differential Effects of Treatments

To determine whether or not there were any significant differences in the effects of the five treatments in the Part 2 research design on dependent variables in the study, first of all a MANOVA was conducted on pre-test performance. This test being statistically significant (TABLE 8.8, p.264), one-way ANOVAS were completed for pre-test performance on each dependent variable in order to clarify which of them displayed significant between-groups differences. The results are summarised in TABLE 8.9 (p.265), while the detailed analyses are reported in Appendix F.1 (pp.422-428).

For dependent variables where the pre-test ANOVA was statistically non-significant, Hypothesis 2.2 in the study was tested by a further ANOVA on post-test performance and, if a significant F-ratio resulted, by *post hoc* comparisons of treatment group means using Duncan's New Multiple Range test. Alternatively, for dependent variables where the pre-test ANOVA was statistically significant, Hypothesis 2.2 was tested by an ANCOVA on post-test performance with pre-test performance as the covariate and, if a significant F-ratio resulted, by again using Duncan's test to compare treatment group means. The results of these two kinds of analyses are presented in summary form in TABLE 8.10 (pp.266-267) and are fully detailed in TABLE 8.15 (pp.272-290).

As can be seen in TABLE 8.10, the post-test ANOVAS (or ANCOVAS) indicated highly significant differences in the effects of treatments on the thirteen dependent variables listed below. For these thirteen variables, therefore, Hypothesis 2.2 that there would be no significant differential effects for treatments was rejected:

CONTROL FUNCTIONS OF QUESTIONS

1. Fluency-control ($p \leq .001$).
2. Cognitive episode control ($p \leq .001$).
3. Episode sustaining tendency ($p \leq .005$).
5. Probing tendency ($p \leq .001$).

LOGICAL FUNCTIONS OF QUESTIONS

8. Low order initial questioning ($p \leq .001$).
10. High order initial questioning ($p \leq .001$).
11. High order probing ($p \leq .002$).

TEACHER-PUPIL TALK PATTERNS

12. Amount of teacher talk ($p \leq .001$).
13. Repetition of pupil responses ($p \leq .009$).
14. Asking yes/no questions ($p \leq .002$).
15. Answering own questions ($p \leq .007$).
18. Extended ideas pupil responses ($p \leq .03$).
19. Coordinate-reactive pupil responding ($p \leq .029$).

TABLE 8.10 also shows that there were no significant differential effects for treatments on six dependent variables.

CONTROL FUNCTIONS OF QUESTIONS

4. Redirection of questions.
6. Using pupil ideas.
7. Structuring with questions.

LOGICAL FUNCTIONS OF QUESTIONS

9. Middle order initial questioning.

TEACHER-PUPIL TALK PATTERNS

16. One idea pupil responses.
17. Several ideas pupil responses.

For the thirteen variables above on which Hypothesis 2.2 was rejected, differences in treatment effects were clarified by using Duncan's New Multiple Range test. The results for comparisons among all pairwise treatment group means are outlined below:

Post hoc comparisons: control functions of questions

(TABLES 8.10 and 8.15)

Variable 1: FLUENCY-CONTROL IN QUESTIONING. For increasing fluency control, both the video and audio treatments in microteaching were significantly superior to no-treatment, as also were the video and audio treatments in observation-analysis ($p \leq .01$ for all comparisons). The microteaching-audio treatment was significantly superior to observation-analysis with audio ($p \leq .05$). No other significant inter-group differences were found.

Variable 2: COGNITIVE EPISODE CONTROL. For developing fewer episodes at greater length in discussion lessons, both the video and audio treatments in microteaching were significantly superior to observation-analysis with video ($p \leq .01$) and to no-treatment ($p \leq .01$). Observation-analysis with audio was also more effective than no-treatment ($p \leq .01$). All other comparisons of group means produced non-significant results. On this variable, however, TABLE 8.15 (2) shows that homogeneity of variance among treatment groups could not be accepted.

Variable 3: EPISODE SUSTAINING TENDENCY. For helping student teachers increase the number of sustaining questions per discussion lesson episode, the video treatment in microteaching was significantly more effective than observation-analysis with video ($p \leq .01$) and no-treatment ($p \leq .01$). No other inter-group differences were obtained. TABLE 8.15 (3) shows, however, that homogeneity of variance among treatment groups on this variable could not be accepted.

Variable 5: PROBING TENDENCY. As a means of increasing the proportion of probing questions in all questions asked, both the video and audio treatments in microteaching were significantly superior to observation-analysis with video ($p \leq .01$ and $p \leq .05$ respectively). The microteaching-video treatment was also superior to

no-treatment ($p \leq .01$), while observation-analysis with audio was significantly superior to a video-backed programme ($p \leq .05$). In all other comparisons made, no significant inter-group differences were obtained.

Post hoc comparisons: logical functions of questions

(TABLES 8.10 and 8.15)

Variable 8: LOW ORDER INITIAL QUESTIONING. For reducing the proportion of low order questions in all initial questions asked, both the video and audio treatments in microteaching were significantly more effective than either of the two media treatments in observation analysis ($p \leq .05$) or no-treatment ($p \leq .01$). There were no other significant inter-group differences.

Variable 10: HIGH ORDER INITIAL QUESTIONING. On this variable, the pattern of significant differential effects for treatments duplicated that found for Treatment 8 above. Both media treatments in microteaching were significantly superior to both media treatments in observation-analysis and to no-treatment, all differences reaching the .01 level of significance. No other significant inter-group differences were obtained.

Variable 11: HIGH ORDER PROBING. Both the video and audio treatments in microteaching produced a significantly greater tendency to probe pupil responses for higher level thinking than did observation-analysis with video ($p \leq .05$ and $p \leq .01$ respectively) and no-treatment ($p \leq .05$ and $p \leq .01$ respectively). There were no other significant inter-group differences.

Post hoc comparisons: teacher-pupil talk patterns

(TABLES 8.10 and 8.15)

Variable 12: AMOUNT OF TEACHER TALK. For reducing the amount of teacher talk-time in contrast to that of pupils, the video and audio treatments in microteaching were both significantly superior to observation-analysis with video ($p \leq .05$ and $p \leq .01$ respectively) and to

no-treatment ($p \leq .01$ for both comparisons). No other significant inter-group differences were found.

Variable 13: REPETITION OF PUPIL RESPONSES. On this variable, only two significant inter-group differences were obtained: both media treatments in microteaching were more effective than no-treatment in reducing the tendency to repeat pupil responses ($p \leq .01$ for both comparisons). However, as TABLE 8.15 (13) shows, homogeneity of variance among treatment groups on this variable could not be accepted.

Variable 14: ASKING YES/NO QUESTIONS. For reducing this tendency, both the video and audio treatments in microteaching were significantly superior to observation-analysis with video ($p \leq .05$ and $p \leq .01$ respectively) and to no-treatment ($p \leq .05$ and $p \leq .01$ respectively). Microteaching with audio was significantly superior to observation-analysis with audio ($p < .05$). There were no other significant differential effects for groups.

Variable 15: ANSWERING OWN QUESTIONS. For reducing this tendency, both the video and audio treatments in microteaching were significantly more effective than no-treatment ($p \leq .01$ and $p \leq .05$ respectively) while the microteaching-video treatment was also superior to observation-analysis with video ($p \leq .05$). No other significant inter-group differences were found. On this variable, however, the results for comparisons among group means need to be qualified in two respects: first, there was heterogeneity of variance among treatment groups; secondly, the very low incidence of answering one's own questions across all groups meant that a statistically significant result could arise from only a slight mean difference and thus not be of much import in real terms (see the data in TABLE 8.15 (15)).

Variable 18: EXTENDED IDEAS PUPIL RESPONSES. On this variable, there were only two significant inter-group

comparisons: the audio treatment in microteaching was superior to both observation-analysis with video ($p \leq .05$) and to no-treatment ($p \leq .01$).

Variable 19: COORDINATE-REACTIVE PUPIL RESPONDING. The pattern of results on this variable was the same as found for Variable 18 above. The microteaching-audio treatment was significantly superior to both observation-analysis and to no-treatment ($p \leq .01$ for both comparisons). No other significant inter-group differences were obtained.

Summary

Highly significant F-ratios were found for thirteen of the ANOVAS (or ANCOVAS) carried out on post-test performance of the five treatment groups in the Part 2 research design related to the nineteen dependent variables in the study. One of these results was of little import in that the behaviour — answering one's own question — occurred so seldom in the lessons taken by all groups. Moreover, homogeneity of variance was not evident among treatment groups on Variables 2, 3, 13 and 15. Bearing these qualifications in mind, the differential effects of treatments in the Part 2 research design may be summarised as follows:

(i) There was no significant difference in the performance of student teachers in the two media treatment groups for microteaching on any of the nineteen dependent variables.

(ii) Student teachers in both the video and audio groups in microteaching performed significantly better than participants in the observation-analysis with video treatment on seven teaching variables:

2. Cognitive episode control.
5. Probing tendency.
8. Reducing low order initial questioning.
10. Increasing high order initial questioning.
11. Increasing high order probing.
12. Decreasing the amount of teacher talk.
14. Decreasing asking of yes/no questions.

In addition, student teachers in the microteaching-video group performed better on Variable 3 (episode sustaining tendency) and Variable 15 (less answering of own questions),

while those in the microteaching-audio group performed better on Variables 18 and 19 (more extended ideas pupil responding and coordinate-reactive pupil responding).

(iii) Student teachers in both the video and audio treatments in microteaching performed significantly better than members of the observation-analysis with audio group on two variables only:

8. Reducing low order initial questioning.
10. Increasing high order initial questioning.

In addition, student teachers in the microteaching-audio group were superior on Variables 1 and 14 (greater fluency control in questioning and less asking of yes/no questions).

(iv) Student teachers in both the video and audio treatments in microteaching performed significantly better than members of the no-treatment group on nine dependent variables:

1. Fluency-control in questioning.
2. Cognitive episode control.
8. Reducing low order initial questioning.
10. Increasing high order initial questioning.
11. Increasing high order probing.
12. Decreasing teacher talk-time.
13. Decreasing repetition of pupil responses.
14. Decreasing asking yes/no questions.
15. Decreasing answering own questions.

In addition, student teachers in the microteaching-video group performed better on Variable 3 (episode sustaining tendency) and Variable 5 (probing tendency), while those in the microteaching-audio group performed better on Variables 18 and 19 (more extended ideas pupil responding and coordinate-reactive pupil responding).

(v) There was no significant difference in the performance of student teachers in the two media treatments for observation analysis on any of the dependent variables except for Variable 5 (probing tendency) where the audio treatment was superior to video.

(vi) Except for two variables, there was no significant difference in the performance of the two media treatments in observation analysis and no-treatment. The exceptions included Variable 1

(fluency-control in questioning) where both observation analysis treatments were superior, and Variable 2 (cognitive episode control) where the observation-analysis with audio treatment was superior.

(vii) There was no significant difference among any of the five treatment groups in the effects they had on six teaching variables:

4. Redirection of questions.
6. Use of pupil ideas.
7. Structuring with questions.
9. Middle order initial questioning.
16. Stimulating one idea pupil responses.
17. Stimulating several ideas pupil responses.

In addition, there was no significant difference in the effects of all media treatments in microteaching and observation-analysis on Variable 13 (repetition of pupil responses).

Discussion of the Results

What is striking about the overall and differential effects of treatments reported above is that division of microteaching and observation-analysis into their media sub-treatments produced much the same pattern of results as was found for these treatments as a whole in the Part 1 research design. This was especially so in the case of microteaching. The discussion in this section attempts to point up common and contrastive patterns in the results for the first two research designs.

Considering first the two media treatments in microteaching, these were equally effective in bringing about significant change on fourteen of the sixteen variables for which microteaching as a whole had produced change in the Part 1 design. The common performance changes involved (i) five control functions of questions (increases in fluency-control, episode control, episode sustaining tendency, probing tendency and structuring with questions); (ii) four logical functions of questions (less low order initial questioning and more middle and high order questioning, coupled with more high order probing); and (iii) five talk patterns (less teacher talk, repetition of pupil responses and one idea pupil responding, as well as increases

in several ideas pupil responding and coordinate-reactive response patterns).

On two more variables, only the microteaching-video group made significant performance shifts: less answering of own questions, and more extended ideas pupil responding. However, while the audio group maintained its pre-test performance level on these two variables, ANCOVAS which took account of initial inter-group differences showed that there were no significant differential effects for the video and audio treatments. Even so, in practical terms this finding has little meaning in the case of answering one's own questions since the microteaching group as a whole in the Part 1 design seldom used this behaviour. In short, there was little behaviour to change.

Also of interest is the close match in the Parts 1 and 2 designs of the pattern for the non-significant effects of microteaching: neither microteaching as a whole, nor either of its two media sub-treatments taken separately, led to any significant change on the same three variables (in the redirection of questions, using pupil ideas, and in asking yes/no questions).

To summarise to this point, the results discussed above suggest that either a video or audio treatment could be used in a microteaching programme emphasising cognitive questioning skills and produce similar performance outcomes; and that either of these treatments alone would be likely to have similar effects to a microteaching programme which incorporated both.

Turning now to observation-analysis, the results show that both the video and audio sub-treatments were equally effective in producing significant change on six of the eleven variables for which their treatment as a whole had led to change in the Part 1 design. The common changes included: (i) two control functions of questions (increases in fluency-control and structuring with questions); (ii) two logical functions of questions (less low order and more middle order initial questioning); and (iii) two talk patterns (less one idea and more several ideas pupil responding).

On the remaining dependent variables, the pattern of effects varied between the two media treatments, and also between these and their treatment as a whole in the Part 1 design. For example,

neither the media sub-treatments nor observation-analysis as a whole led to significant changes in the use of sustaining questions, redirection of questions, using pupil ideas, amount of teacher talk, repetition of pupil responses and answering one's own questions. On the other hand, whereas in the Part 1 design observation-analysis as a whole produced changes in high order probing, asking yes/no questions (an increase) and extended ideas pupil responding, neither of its media sub-treatments in the Part 2 design matched these shifts. For these variables, therefore, it appears that only the pooled effects of the video and audio sub-treatments could bring about a significant change. In contrast to this pattern, on four further variables only the audio sub-treatment matched the significant effects of its treatment as a whole: fewer lesson episodes, and increases in probing tendency, high order initial questioning and coordinate-reactive pupil responding. This finding suggests the possibility that it was the audio more than the video treatment which contributed to the effectiveness of observation-analysis as a whole on these variables in the Part 1 design.

To summarise again, the preceding discussion indicates that there was a much closer parallel between the effects of each of the two media treatments in microteaching and those for their treatment as a whole than was evident in the comparisons made for similar groups in observation-analysis. Compared with microteaching, therefore, one can be less confident that video and audio treatments in an observation-analysis programme would be likely to produce the same pattern of results on a wide variety of questioning skills; or that either of these media treatments could be substituted equally well for an observation-analysis programme which incorporated both of them.

Comparing now the results for the differential effects of treatments in the Parts 1 and 2 research designs, it was noted that video and audio <u>microteaching</u> in the Part 1 design was significantly superior to video and audio <u>observation-analysis</u> on nine variables. A closer examination of these findings through the second research design, however, showed that this microteaching superiority mainly concerned its video and audio sub-treatments over video observation analysis (seven variables), and that each of these sub-treatments

was only superior on two variables to audio observation-analysis. With regard to the remaining dependent variables, microteaching and observation-analysis treatments in the Parts 1 and 2 research designs were either equally effective or equally ineffective, or else further analysis of their equal effectiveness in the Part 1 design identified no trend favouring either of the media sub-treatments in microteaching.

These results suggest that the superiority of microteaching in the Part 1 design reflected, in good part, the superiority of both its media sub-treatments over video rather than audio observation analysis. Even so, the inference cannot be made that audio observation-analysis is generally superior to its video counterpart. As earlier discussion has pointed out, observation-analysis with audio was significantly more effective than the video treatment on one teaching variable only, namely, probing tendency.

The patterns of differential effects in the Parts 1 and 2 research designs for microteaching and no-treatment are much closer to each other than is the case with microteaching and observation analysis. In the first design, video and audio microteaching was significantly superior to no-treatment on twelve variables. Further analysis of these results through the second design showed that, on ten of these variables, both the video and audio treatments in microteaching were significantly more effective than no-treatment. Moreover, like microteaching as a whole, its video and audio sub-treatments were just as effective as no-treatment on four variables, as well as being equally ineffective concerning two others. On three variables only, was the pattern of differential effects for microteaching and no-treatment in the first two research designs somewhat mixed: whereas microteaching as a whole was superior to no-treatment for increasing probing and coordinate-reactive pupil responding, in the second design these two increases were evident only for video and audio microteaching respectively; again, although microteaching as a whole and no-treatment were equally effective for increasing extended ideas pupil responding, results for the second research design showed that audio but not video microteaching was

was more effective than no-treatment.[4]

By and large, then, the results just outlined indicate that the general superiority of microteaching over no-treatment in the Part 1 research design was not due to any particular media sub-treatment. While the results might also appear to suggest slightly more effectiveness for one media treatment or the other on several teaching variables, earlier discussion has emphasised that the video and audio treatments in microteaching were found to be equally effective in producing significant change on sixteen of the nineteen dependent variables in the study.

Finally, some rather mixed results are evident concerning the differential effects of media treatments in observation-analysis, compared with no-treatment. In the Part 1 design, observation analysis, taken as a whole, was significantly more effective on four teaching variables: increases in fluency-control in questioning and in episode control, and less low order initial questioning and repetition of pupil responses. Further analysis through the Part 2 design showed, however, that both media treatments in observation analysis were significantly more effective for increasing fluency control in questioning, but only audio observation-analysis was more effective regarding episode control. On the other two variables, both the media treatments in observation-analysis and no-treatment all had equal effects. This suggests that the superiority found for observation-analysis as a whole over no-treatment on these two variables rested upon the pooled effects of its video and audio sub-treatments, rather than being due to the greater influence of one of these sub-treatments or the other.

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4 This finding may well be explained by the observation that analysis of differential effects of treatments in the Part 1 research design almost reached significance level ($p \leq .06$) and that, at the level obtained, the mean performance of micro-teachers was greater than that for the observation-analysis and no-treatment groups.

The Results — Part 3 Research Design

Microteaching in the present study not only included the video and audio treatments discussed with reference to the Part 2 research design above, but also different pupil treatments (teaching children or peers) and question type practice opportunities (practising middle order or high order questions). Thus the third major hypothesis in the study concerned the overall and differential effects of pupil, media and question practice factors in microteaching, as well as combinations of these factors, on the same nineteen dependent variables that were examined in the Parts 1 and 2 research designs.

Hypothesis 3.1 stated that microteachers experiencing a particular pupil, media or question practice treatment (or combination of these treatments) would make no significant changes in teaching performance between their pre- and post-test lessons.

Hypothesis 3.2 stated that there would be no significant differences in the amount of change caused by particular microteaching treatments (or their combinations) on pre- to post-test teaching performance.

The experimental results are reported below first for the overall effects of treatments, and then for their differential effects.

Overall Effects of Treatments

The results for the paired sample t tests (2-tailed) carried out on pre- to post-test performance of the various microteaching treatment groups are given in summary form in TABLE 8.18 (pp.294-295) and are detailed in TABLE 8.19 (p.296).

These tables show that t tests for the nineteen dependent variables in the study involved pre- and post-test means for all treatment groups combined. Adoption of this procedure was required because no differential effects involving the various specific microteaching treatments had been found in the relevant analyses (see the section below). In effect, then, the nineteen t tests were equivalent to those taken in the Part 1 research design for

microteaching treatment as a whole.[5]

All kinds of pupil, media and question practice treatments in microteaching — as well as combinations of these treatments — led to significant shifts in pre- to post-test performance on the sixteen variables listed below. For these sixteen variables, therefore, Hypothesis 3.1 that there would be no significant changes in teaching performance was rejected:

CONTROL FUNCTIONS OF QUESTIONS		
1.	Fluency-control ($p \leq .001$)	Increase
2.	Cognitive episode control ($p \leq .001$)	Increase
3.	Episode sustaining tendency ($p \leq .001$)	Increase
5.	Probing tendency ($p \leq .001$)	Increase
7.	Structuring with questions ($p \leq .05$)	Increase
LOGICAL FUNCTIONS OF QUESTIONS		
8.	Low order initial questions ($p \leq .001$)	Decrease
9.	Middle order initial questions ($p \leq .001$)	Increase
10.	High order initial questions ($p \leq .001$)	Increase
11.	High order probing ($p \leq .001$)	Increase
TEACHER-PUPIL TALK PATTERNS		
12.	Amount of teacher talk ($p \leq .001$)	Decrease
13.	Repetition of pupil responses ($p \leq .001$)	Decrease
15.	Answering own questions ($p \leq .003$)	Decrease
16.	One idea pupil responses ($p \leq .001$)	Decrease
17.	Several ideas pupil responses ($p \leq .001$)	Increase
18.	Extended ideas pupil responses ($p \leq .004$)	Increase
19.	Coordinate-reactive pupil responding ($p \leq .001$)	Increase

TABLE 8.18 also shows that, no matter what kind of microteaching treatment was involved, there was no significant change in performance on the following three variables. For these variables, therefore, Hypothesis 3.1 was accepted:

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5 A comparison of the data in TABLE 8.19 (p.296) with that in TABLE 8.4 (p.241) reveals that the results for t tests on these sixteen variables were, in fact, equivalent.

CONTROL FUNCTIONS OF QUESTIONS

4. Redirection of questions.

6. Using pupil ideas.

TEACHER-PUPIL TALK PATTERNS

14. Asking yes/no questions.

Differential Effects of Treatments

To determine whether or not there were any significant differences in the effects of pupil, media and question type treatments in microteaching on the nineteen dependent variables in the study, first of all a MANOVA was conducted on pre-test performance. This test being statistically significant (TABLE 8.16: p.291), factorial ANOVAS were carried out for pre-test performance on each dependent variable in order to clarify which of them displayed significant between-group differences. The results are summarised in TABLE 8.17 (pp.292-293), while the detailed analyses are reported in Appendix F.2 (pp.429-438).

For dependent variables where the factorial ANOVA on pre-test performance was statistically non-significant, Hypothesis 3.2 in the study was tested by a further factorial ANOVA on post-test performance to identify any significant main and interaction effects for microteaching treatments. Alternatively, for dependent variables where the pre-test factorial ANOVA was statistically significant, Hypothesis 3.2 was tested by a factorial ANCOVA on post test performance with pre-test performance as the covariate, once again seeking to identify any significant main and interaction effects for treatments.

The results of the two kinds of analyses just outlined are reported in summary form in TABLE 8.18 (pp.294-295), and are fully detailed in TABLE 8.20 (pp.297-323). As these tables show, statistically significant results appeared with reference to only six of the nineteen dependent variables in the study.

On two variables, there were significant main effects for Factor P (pupils taught in the microclasses) favouring the use of school children over student teacher peers: Variable 2, cognitive episode control ($P \leq .009$; $\bar{X}_{Mc} = 7.9167$, $\bar{X}_{Mp} = 10.0000$); and

Variable 10, high order initial questioning ($P \leq .02$; $\bar{X}_{Mc} = .5378$, $\bar{X}_{Mp} = .4122$).

In the case of each of four other variables, a single first order interaction effect resulted. On Variable 9 (middle order initial questioning), there was an interaction of the pupils taught with the question type practised ($P \leq .048$), indicating that any effects due to Factor P (teaching children or peers) depended upon the particular level of Factor Q that was experienced (practising middle or high order questioning). The data suggest that micro-teaching children was more effective when practising middle rather than high order questions ($\bar{X}_{Mcm} = .3415$, $\bar{X}_{Mch} = .2598$), but that microteaching peers was more effective when practising high rather than middle order questions ($\bar{X}_{Mph} = .4219$, $\bar{X}_{Mpm} = .2873$).

On Variable 13 (repetition of pupil responses), the significant interaction concerned the pupils taught and the media experienced ($P \leq .01$). It appeared that microteaching children with video support was more effective for reducing the tendency to repeat pupil responses than was microteaching children with audiotape support ($\bar{X}_{Mcv} = .0181$, $\bar{X}_{Mca} = .0572$), but that this picture of media superiority was reversed when the microclass comprised student teacher peers ($\bar{X}_{Mpa} = .0388$, $\bar{X}_{Mpv} = .0858$).

On each of Variables 18 and 19 (extended ideas pupil responding and coordinate-reactive pupil responding), there was an interaction effect for the media experienced and the question type practised ($P \leq .05$ and $P \leq .02$ respectively). However, the directions of interaction effects were different for each of these two variables. Thus, for increasing extended ideas responding, video treatment was more effective when supporting the practice of high rather than middle order questioning ($\bar{X}_{Mvh} = .1764$, $\bar{X}_{Mvm} = .1014$), while the reverse situation was found for the audio treatment ($\bar{x}_{Mam} = .2010$, $\bar{X}_{Mah} = 1643$). Yet this picture of opposite effects was itself reversed in the case of coordinate-reactive responding (on the one hand $\bar{X}_{Mah} = .5155$, $\bar{X}_{Mvh} = .4390$ and, on the other, $\bar{X}_{Mah} = .6244$, $\bar{X}_{Mam} = .4418$).

At first glance, the findings outlined above suggested that the hypothesis of no-significant difference should be rejected

regarding Variables 2, 10, 9, 13, 18 and 19. However, these six significant results had to be considered in the context of (i) the total number of statistical tests that were carried out in the Part 3 research design concerning the differential effects of treatments, and (ii) the interrelated nature of the nineteen teaching variables being measured. Altogether there were 133 tests of significance involved, i.e., the possibility of three main and four interaction effects (a total of seven tests) on each of the nineteen dependent variables.

It will be remembered that the level set in the present study for accepting significance of effect was .05. Consequently, six significant results in a total of 133 tests would be within the tolerable limits allowed, and could well have been due simply to chance rather than to systematic treatment effects. Moreover, the magnitude of difference between the mean performance of the children and peer teaching groups in episode control and high order questioning (Variables 2 and 10) was not so great as to suggest that a microteaching programme should be specifically adjusted for increasing performance on these two variables. Further still, the interaction effects on the other four variables (Nos. 9, 13, 18 and 19), provided qualified rather than clear-cut direction for programming purposes. On both statistical and practical grounds, therefore, it was decided that the hypothesis of no-significant difference between all kinds of microteaching treatments within the Part 3 research design should be accepted for all nineteen of the dependent variables in the study.

Discussion of the Results

Because microteaching is usually associated with the idea of concentrated periods of teaching practice, an especially interesting feature of the findings in the Part 3 research design is the absence of a main effect for Factor Q — that is, practising middle or high order initial questions only, while observing the cognitive level for questions not practised being used by fellow microteachers. As the results show, student teachers experiencing either of these two practice conditions performed equally well, not only regarding both middle and high order initial questioning, but also on fourteen

other teaching variables. Apparently, when students can observe half of their microteaching group practising the question type not practised by themselves, and also have opportunity to code, analyse and provide objective feedback on the microlessons of these other students, the question type not practised may be learned 'vicariously' and teaching skills associated with either type of initial question may also be readily acquired.

These findings, coupled with the equivalent effects found for teaching children and peers, and for using video and audiotape, have important practical implications for any teacher education programme incorporating the sensitisation approach to microteaching. It seems that microteaching may operate successfully and, at the same time, overcome some of the logistic, resource and excessive use of time problems that beset many programmes by (i) substituting simulated microteaching of student teacher peers for the teaching of school children; (ii) substituting the cheaper and more readily available audiotape recorder for video equipment to support analysis of teaching and feedback activities; and (iii) reducing student teachers' committed time for microteaching by having them practise some questioning skills directly, while learning others 'vicariously'. Put another way, on average, there would be no significant difference in the overall effects of, on the one hand, a treatment involving simulated microteaching of peers, use of audiotape and practice of middle order initial questions while observing other students using the high order variety and, on the other hand, a treatment using children in its microclasses, videotape support and the practice of high order initial questions while observing middle order questions being used by fellow students.

Concerning the equivalence found for simulated microteaching and the teaching of children, it is important to note that the simulated treatment in the present study involved the pursuit of genuine adult-level learning objectives with five members of a microteacher's group ($n = 6$), and that these same five persons also provided the microteacher with objective feedback on his teaching efforts for self-analysis purposes. In other words, the effects of peer teaching stemmed not only from practice teaching (five opportunities for microteaching in the whole programme), but from

this combined with a number of opportunities to act as a pupil and as a coder and giver of feedback for one's fellow students (twenty five times in all). Thus, each student played a participant-observer rôle, rather than simply being involved in the practice of teaching.

Finally, certain relationships may be inferred between findings in the Part 3 research design and those reported earlier for micro-teaching in the first and second designs. To begin with, each microteaching sub-treatment in the Part 3 design produced the same pattern of changes in pre- to post-test teaching performance as did microteaching as a whole in the first research design which, it will be remembered, comprised a combination of all sub-treatments included in the third design. In addition, however, the equivalence found for all of these sub-treatments suggests first, that the general superiority of microteaching over observation-analysis and no-treatment in the Part 1 design was not due to any particular microteaching sub-treatment; and, secondly, that if any one of the treatments in the third design had been substituted for micro-teaching as a whole in the first design, it would have been likely to produce a similar pattern of superiority over the observation analysis and no-treatment conditions.

Turning now to the Part 2 and Part 3 research designs, clearly the equal effects overall for the two media treatments in micro-teaching in the third design merely duplicate findings in the second design. Beyond this, however, the equivalent effects of all micro-teaching sub-treatments in the Part 3 design suggest the probability that, had any particular microteaching treatment been substituted for either video or audio microteaching in the second design, a similar pattern of superiority for microteaching over video and audio observation-analysis, as well as over no-treatment, would have resulted.

To summarise, then, results for the Part 3 research design show that all kinds of pupil, media and question practice treatments in microteaching, as well as their various combinations, were equally effective in causing change in pre- to post-test teaching performance on sixteen of the nineteen dependent variables in the study, and equally ineffective regarding the remaining three. These findings lead to a conclusion that, had any of the various micro-

teaching treatments in the Part 3 research design replaced micro-teaching as a whole in the first design, or its two media sub-treatments in the Part 2 design, the general trend in both of these designs that microteaching was more effective than either observation-analysis and no-treatment would have been duplicated.

The Results — Attitudes towards Microteaching and Observation-analysis

Testing Hypothesis 4

The fourth major hypothesis in the study stated that there would be no significant differences in attitude towards the general effectiveness of microteaching by student teachers who practised (a) with different pupils (c = children, p = peers), (b) with different media (v = videotape, a - audiotape), and (c) with different combinations of pupil and media treatments.

FIGURE 8.2 (p.344) gives the twenty-two statements that were selected from a comprehensive Likert-type opinion questionnaire in order to test Hypothesis 4. All 48 microteachers responded at the end of their course to each of these items which were subjected to a principal component factor analysis. Four factors with eigenvalues greater than 1 were produced, accounting between them for 47% of the total variance (TABLE 8.33: p. 345). These were subjected to a varimax rotation which identified value of microteaching as the major factor (22% of the variance) followed by a microteaching effectiveness factor (9%), a reality for microteaching factor (9%), and a skills familiarity factor (8%).

Subsequently, microteachers' factor scores were subjected to a MANOVA in which the effects of different pupils taught, different media experienced, and the interaction of these different treatment conditions were considered. The results in TABLE 8.34 (p.346) show that, among all of the various microteaching groups, there was no significant difference in attitude towards the value, effectiveness and reality of the microteaching programme that was offered, nor in the degree of familiarity with the skills that this programme emphasised. Consequently, Hypothesis 4 that the general effectiveness of microteaching would be similarly regarded by all treatment groups was accepted. Overall opinions of the 48 microteachers are reported below.

Attitudes towards Microteaching

Programme Effectiveness (TABLE 8.21: pp.324-326)

Responses to items coded 1A, 1B and 1C in TABLE 8.21 formed the basis for the factor analysis and MANOVA referred to above. As can be seen in this table, mean responses for the various treatment groups were very similar which tends to confirm the acceptance of Hypothesis 4.

a. Almost all participants agreed that microteaching was an effective way of learning to use questioning and reacting skills, with only a few (8%) feeling that microteaching lacks reality. No students felt that microteaching cramped their personal teaching style, while the vast majority (90%) believed that the skills acquired would transfer readily to various curriculum areas, as well as to working with larger pupil groups in the classroom setting.

b. An overwhelming majority of students saw the microteaching course as a valuable and necessary experience for all prospective teachers, although just over half were undecided (or disagreed) that the course should be offered earlier than the third year of their college programme in professional studies.

c. The findings in b. above are interesting first, because two thirds of the students held that skills in the course were mostly new to them and secondly, because only a few (2%) felt that they were already confident and competent in using these skills before the course began. Moreover, all students agreed (88% strongly agreed) that having a wide repertoire of questioning and reacting skills was an important professional characteristic.

d. The great majority of students (92%) indicated that their interest was maintained throughout the course, and that they would be keen (96%) to participate in further such courses.

e. Approximately three-quarters of the students agreed that analysis of teaching was useful; that they found themselves analysing teaching situations elsewhere as a result of their microteaching experience; and that it was desirable for college staff to use interaction analysis procedures to provide objective data on student teaching when visiting during school practice periods.

f. There was general agreement (98%) that microteaching groups worked as mutually supportive units, and fairly strong agreement (73%) that microteaching activities helped one learn how to contribute effectively as a member of a team.

Programme Components (TABLE 8.22: pp.327-330)

a. More than 90% of students agreed that the cumulative arrangement of clusters of interrelated skills laboratory to laboratory was an effective means of acquiring repertoire control. Only a few (6%) felt that a one-skill-at-a-time approach would have been more effective.

b. The analysis of teaching session introducing each laboratory was well-received. However, the audio groups were not as impressed with the cueing of teaching samples (via a cueing box) as were the video groups who saw cues displayed on the television screen.

c. There was general agreement (96%) that feedback on teaching performance was an important dimension of the microteaching procedure. Three-quarters of students felt that the 5-10 minute period allowed for feedback sessions was sufficient for their needs.

d. Just over 90% of students agreed that self-analysis aided by objective feedback data from peers led to greater teaching skill, and that the SQUAIES coding system was a useful tool in this regard. Only a few (8%) stated that SQUAIES was difficult to learn.

e. Despite the findings in d. above, opinion was somewhat divided on how difficult it was to maintain objectivity for feedback comments and questions directed to a fellow microteacher: one-third found this a difficult task, one-third had no problem, and one-third were undecided.

f. There was also some division of opinion as to whether or not receiving value-judgments on teaching performance from one's peers would have been more helpful than objective data and comment only: one-fifth of students supported the value judgment approach, two-fifths were undecided, and two-fifths preferred an objective orientation. As it was, the majority of students (79%) agreed that their feedback sessions were indeed of an objective nature and stressed self-analysis and self-evaluation.

g. Concerning the findings in d., e. and f. above, opinions on the rôle of the microteaching supervisor are of special interest. Two-thirds of students agreed that a supervisor should not make value-judgments on their teaching performance or adopt a didactic stance. Yet one-third felt that a supervisor should point out strong and weak points in a performance, and then guide a student to work out for himself how to ameliorate any teaching difficulties (the peers-audio group was more disposed to this view than any of the other groups).

h. Notwithstanding the somewhat mixed opinions in g. above, no student expressed a desire to have private feedback sessions with a supervisor. At the same time, just over four-fifths of students agreed that a supervisor did play an important role during their microteaching laboratories, and that it was

preferable to retain the same supervisor with a group throughout a microteaching course. Seeing that supervisors maintained a non-judgmental rôle in the programme offered (see Chapter 4), it appears that students must have been fairly satisfied with this orientation (compare with the findings below on student estimates of the qualities of an effective microteaching supervisor).

Course Organisation (TABLE 8.23: pp.331-332)

a. Just over 70% of participants agreed that scheduling one-and-a half hour laboratories over one academic term was more desirable than an intensive full-time course spread over several weeks only. Nevertheless, opinion was almost equally divided on whether or not work pressures related to concurrent professional studies courses prevented students from devoting sufficient time to study of their laboratory manuals and to the preparation of microlessons.

b. Opinion was also fairly well split as to whether more opportunities to microteach should have been provided in each laboratory. If anything, those students who taught children were more inclined to this view.

c. Almost two-thirds of the students agreed that a series of three individual microlessons per laboratory session was a suitable arrangement. Furthermore, just over 90% agreed that this approach enabled them to learn from observing fellow students teach.

d. There was fairly general agreement (71%) that the time of 5-10 minutes allowed for microlessons was sufficient to explore particular teaching skills.

Class Size and Composition (TABLES 8.24 and 8.25: pp.333-335)

a. Whether teaching children or peers, students expressed strong agreement (more than 90%) that working with a small group of five pupils was an effective way of developing a skills repertoire.

b. Students who taught children largely agreed (63%) that establishing rapport presented no difficulties, while only a few (8%) encountered any discipline problems. There was strong agreement (92%) that a microteacher should retain the same pupils throughout a microteaching course.

c. No student who participated in simulated microteaching of his peers found this experience uncomfortable, although one-third of these students found planning of lessons at an adult level a difficult experience (more particularly the audio group).

d. Half of those involved in simulated microteaching of peers felt that the responses of their "pupils" were of such quality that the need to ask probing and other types of sustaining questions was often obviated. On the other hand, the large majority of

these same students (92%) agreed that being a "pupil" for fellow students helped them develop greater sensitivity to the skills being practised. It is interesting also that opinion was somewhat divided as to whether it would have been preferable to teach children instead of peers: 21% agreed, 46% were undecided, and 33% disagreed that teaching school pupils would be a superior learning experience.

Use of Videotape and Audiotape (TABLES 8.26 and 8.27: pp.336-338)

a. Students generally agreed that replays of their microlessons — whether by videotape or audiotape means — added significantly to the value of feedback sessions.

b. In the video group, only a few students (4%) felt that the presence of videotaping equipment distracted them or their pupils, or inhibited their teaching efforts. Similarly, only 8% of students in the audio groups felt this way.

c. Neither the video or audio replay of teaching performance was regarded as an uncomfortable experience by the majority of students.

d. Of those who received audiotape replays of their teaching, almost one-third were undecided as to whether a video replay was preferable, while two-thirds felt that this would not give any extra benefits.

e. In the video groups, two-thirds of the students felt that the visual image during replays of lessons did not divert attention from teacher-pupil verbal interaction. When coding, however, it is interesting to note that two-thirds of these same students agreed that they concentrated on the video soundtrack rather than on the visual images on the television screen.

Qualities of an Effective Supervisor (TABLE 8.28: p.339)

On the basis of frequency of mention, the six qualities held by students to be most important for a microteaching supervisor to possess were as follows:

1st Warmth, empathy and sincere interest in students as persons and as prospective teachers.
2nd Willingness to be non-judgmental and non-directive.
3rd Skill in encouraging self-evaluation of teaching.
4th Receptivity to others' ideas.
5th Knowledge of, and experience with, a variety of teaching skills.
6th Leadership skills that produce group cohesiveness.

The most difficult skills (TABLES 8.29 and 8.30: pp.340-341)

The order of felt difficulty for learning skills was expressed as follows:

1st Asking probing questions.
2nd Using high order questions to initiate episodes.
3rd Learning to use the SQUAIES coding system.
4th Discriminating the cognitive level of questions used to initiate episodes.
5th Using middle order questions to initiate episodes.

As can be seen in TABLE 8.30, this order tended to be the same in each of the children-video, children-audio, peers-video and peers-audio treatment groups.

Major impacts of microteaching (TABLE 8.31: p.342)

Four positive outcomes of the microteaching course were mentioned most frequently by students:

a. Improved knowledge and awareness of a repertoire of discussion leading skills — in particular, questioning and reacting skills — resulting in greater competence and awareness of oneself as a teacher.

b. Greater child-centredness in teaching approach: increased sensitivity to pupils as individuals, encouragement of pupil participation, and allowing pupils to take the lead.

c. Greater understanding of the complexity of questioning as a teaching skill.

d. Ability to self-evaluate teaching performance.

Improvements to the Microteaching Course (TABLE 8.32: p.343)

There were far fewer comments made by students on this questionnaire item than in response to those in the sections just reported. The most frequently mentioned recommendation was that the course should be extended over two academic terms in order that more time could be spent on each laboratory and thus provide more teaching opportunities. Of the remaining comments, four students saw a need for longer feedback sessions. As TABLE 8.32 shows, a variety of other suggestions were made but only by one or two students in each instance.

Attitudes towards Observation-analysis

The main findings from an analysis of responses to the similar attitude questionnaire administered to the observation-analysis students (n = 24) at the end of their course, are as follows:

Programme Effectiveness (TABLE 8.35: pp.347-349)

a. All respondents agreed (38% strongly agreed) that analysis of teaching was a valuable learning experience. The majority (92%) felt that they would actually be able to use the skills studied in a variety of curriculum areas and in their own classroom teaching. Moreover, two-thirds of participants expressed the view that Teachers College staff should make use of interaction analysis systems when visiting them during school practice periods.

b. There was general agreement (86%) that all student teachers should be required to take the observation-analysis course, and a large consensus (83%) that this should take place earlier than in the third year of a professional studies programme.

c. As a result of their experience in the course, three-quarters of the participants stated that they tended to analyse teaching in a range of other situations.

d. Almost all students (96%) felt that possession of a wide repertoire of questioning and reacting skills was an important professional quality. Although one-third felt that the skills emphasised in the course were not new to them, the majority (83%) also felt that they were not confident or competent in using these skills before the course began.

e. About a quarter of the respondents indicated waning interest as the course proceeded. Nevertheless, three-quarters of them reported that they would be willing to participate in further courses should these be offered.

f. Three-quarters of the students favoured an emphasis on clusters of interrelated skills when learning to analyse teaching. Only a few students (16.7%) felt that focusing on one skill in each laboratory would be a superior approach.

g. A majority of students (83%) agreed that the SQUAIES coding system was a useful tool for analysing teaching behaviour, and almost three-quarters of them felt that the system was easy to learn.

h. Opinion was somewhat split concerning the appropriateness of the scheduled hours for the course. While almost half of the students reported that two sessions weekly over one academic term was sufficient to meet the objectives, just over one-third felt that the course length should be extended. On the other hand, about three-quarters of respondents stated that work pressures from concurrent professional studies prevented them from devoting as much time as they would have ideally liked to study of their laboratory manuals.

Use of Videotape and Audiotape (TABLES 8.36 and 8.37: p.350)

a. Approximately three-quarters of students in the video group felt that the visual cues on the television screen were valuable aids to learning about teaching skills.

b. A more variable picture emerged in the audio group: less than half of the students (42%) were satisfied that the cueing-box provision was helpful in identifying skills.

Major Impacts of Observation-analysis (TABLE 8.40: p.353)

One positive outcome of the course was mentioned far more frequently than any other. This was greater awareness of the variety and importance of questioning skills for leading discussion to stimulate pupil participation and thinking. Various other strengths were mentioned, but only by one or two students in each instance.

Suggested Improvements to the Observation-analysis Course (TABLE 8.41: p.354)

Two suggested improvements stood out above all others:

a. The inclusion of practical experience with children (or even peers) for coding sessions and self-correction.

b. An increase in the total time allocation for the course.

Discussion of the Results

What is especially interesting about the equal regard of all microteaching treatment groups for the effectiveness of the microteaching procedure, is that it is paralleled by the equal effects on teaching performance that were found for all kinds of microteaching treatments in the Part 3 research design. Not only did microteachers generally value microteaching as a means of gaining sensitive control of a repertoire of questioning skills, but, as described earlier in this chapter, all microteaching groups were able to demonstrate such acquisition between their pre- and post-test teaching.

This kind of parallel is evident, too, with reference to composition of the microclass and the media used to support microteaching. To illustrate: just as there was no strong feeling among the majority of peer teaching participants that theirs was an inferior experience to microteaching children, so too both of these treatments in the Part 3 research design were equally effective in causing change on the same sixteen teaching variables. Similarly, most microteachers receiving audiotape backing for their programme saw no special advantages in videotape replays of teaching

performance and, once again, as shown by results for the Part 3 research design, these two media treatments were equally effective means of changing teaching behaviour.

A second major feature of the opinions expressed on micro-teaching is the general support for the emphasis, in a sensitisation approach, on self-analysis of teaching performance, as well as on the non-directive and non-evaluative rôle suggested for the microteaching supervisor.

Thirdly, although microteachers really had no direct experiences on which to base their comparison, it is significant that very few saw the practice of single skills as being superior to the opportunities for personal exploration of clusters of interrelated skills that were provided in their programme.

It is noteworthy, fourthly, that student teachers were somewhat divided in their opinions as to when was the most appropriate time to schedule a microteaching programme on questioning strategies into their teacher education course. Some took the view that the complexity of knowledge and skill encouraged by the microteaching programme could not be handled by student teachers too early in their three-year course; others saw the programme as an essential and integral part of the Year 1 and Year 2 courses on curriculum (Studies in Teaching); and, perhaps because of the proximity to the last period of school practice and the first year of full-time teaching, another group recommended that the microteaching programme should be scheduled during the third and final year of teacher education. Despite these diverse recommendations, it is significant that the vast majority of students felt that all candidates for teaching should undertake the microteaching programme at some point in their college course.

Earlier sections in this chapter have indicated that observation-analysis treatment helped student teachers change their classroom behaviour, albeit that this treatment was not nearly so influential as microteaching. Response to the attitude questionnaire, however, shows clearly that observation-analysis participants also held their experience in high regard as means of attaining awareness and control of a questioning skills repertoire.

Nevertheless, one-quarter expressed waning interest as their course progressed; furthermore, it is significant that a major recommendation made by observation-analysis students for improving their course, was the inclusion of practical work with children to reinforce and extend the learning achieved through analysis activities.

CHAPTER 9

SUMMARY AND CONCLUSIONS

The present research was designed to investigate the potential of microteaching as a sensitisation experience for helping student teachers develop sensitive and flexible control of a wide repertoire of teaching strategies and their associated skills. To this end, an examination was made of the relative effects on teaching performance of a microteaching programme, a course in observation-analysis, and regular coursework in professional studies. Comparisons were also made of different media treatments in microteaching programmes which would make greater or lesser demand upon a Teachers College logistically and in requirements for special resources. It was hoped that the research would provide empirical evidence sufficiently clear-cut to suggest that sensitisation experiences in microteaching would be a worthwhile adjunct to, or should become an integral part of, the professional studies programme at Hamilton Teachers College.

In this final chapter, an attempt is made to summarise and draw conclusions from the research findings, to suggest some directions that further research on the sensitisation approach to microteaching might take, and to consider some theoretical and practical implications of the study.

Limitations of the Design

Before conclusions are drawn from the research findings, it is important to recognise a number of limitations in the research design. First, to keep the study manageable, flexible control of teaching repertoire was examined with reference to one teaching mode only, namely, the small group discussion lesson in which the teacher's cognitive questioning is directed towards getting pupils thinking about ideas concerning particular stimulus material. This

means that caution must be exercised in generalising too widely from the research findings. On the other hand, the small group discussion lesson was purposely selected because it is often used in New Zealand primary school classrooms across a number of curriculum areas and, if the current trend towards open classroom and developmental approaches to teaching is any indication, is likely to be used even more in the future. Furthermore, flexible use of questioning skills applies to a variety of other teaching situations at all levels of the school in which the emphasis is on teacher interaction with pupils, rather than on the teacher as the sole informational source.

Secondly, it should be remembered that the research undertaken was of the process-process type only. It was concerned with identifying the differential effects of particular treatments on student ability to control questioning skills and talk patterns, and not specifically with the relationship between this ability and increased pupil achievement (process-product research). As such, an assumption was made in the study that a reciprocal relationship exists between particular levels of cognitive demand embodied in teacher questions and corresponding levels of pupil thinking; further, that increased skill in handling the inter-personal control functions of teacher questions indicates greater ability to guide pupils in the direction of intended teaching goals.

It should be noted, thirdly, that only indirect comparisons can be made between findings concerning the sensitisation approach to microteaching in the present study, and those from research which has incorporated the skill-by-skill training orientation of the Stanford model. In the light of the critical analysis made of the Stanford approach in Chapter 2, it might have been desirable to contrast the two microteaching models in the present study. Regrettably, constraints on the availability of supervisory personnel, numbers of subjects, audio-visual equipment and time made this impossible. Consequently, the research compared the effectiveness of microteaching as a sensitisation experience with that of other learning experiences able to be organised within the framework of a normal Teachers College programme.

Microteaching Effectiveness

In spite of these inevitable limitations in the scope of the study, it is considered that some educationally significant results emerged from it.

Microteaching compared with Other Programmes

One of the major questions with which the present study was concerned was the relative effect on student teachers' questioning skills of regular coursework in professional studies, and of supplementing this coursework with sensitisation experiences in microteaching or in observation and analysis of teaching. In attempting to answer this question through the Part 1 research design, measures of microteachers' performance represented the pooled effects of different pupil, media and question practice treatments which comprised what was termed microteaching as a whole. The measures of observation-analysis participants' behaviour reflected the pooled effects of video and audio sub-treatments.

Analysis of group discussion lessons audiotaped in the school setting before and approximately two months after treatment, indicated clear and stable changes by microteachers on all but three of the nineteen dependent variables in the study. In terms of educational significance, the most striking of these changes was the strong tendency to initiate and sustain discussion lesson episodes with high rather than low order questions. Nevertheless, changes considered to be educationally worthwhile were also evident in microteachers' tendency to stimulate fewer but longer episodes by probing pupil responses; to initiate episodes with middle order questions; to reduce the amount of teacher talk; to deliver questions fluently and maintain their cognitive direction; and,apparently as a result of using the skill of wait-time, to encourage unsolicited pupil answers as well as pupil-to-pupil dialogue. Other changes which were statistically significant, albeit of less magnitude, were also evident in microteachers' increased use of structuring with questions, and in their ability to question in such a way that a greater proportion of pupil responses contained several, or an

extended number, of substantive ideas instead of one idea only.

Observation-analysis led to significant change on eleven teaching variables, and was as effective as microteaching on almost half of the variables in the study. This lends support to the suggestion (Borg *et al.*, 1969; Friebel and Kallenbach, 1969; Kissock, 1971; Wagner, 1973) that discrimination training and analysis of teaching can be just as effective as an entire micro-teaching sequence of observation, practice and feedback. However, equivalence in effects of the two types of programme should not be over-emphasised. The reported results also show that microteachers were significantly superior to observation-analysis participants on nine teaching behaviours; all of which relate far more directly to the encouragement of pupil thinking than the remaining variables measured in this study. It seems that microteaching is a more effective treatment when the concern is with fluency-control in questioning, with developing fewer but more searching discussion episodes by means of probing questions; with initiating as well as sustaining episodes with high order questions; with decreasing teacher talk; and with minimising the use of questions which elicit simple yes/no responses only.

A similar conclusion can fairly be drawn in the case of micro-teaching versus regular coursework — that is, the 'no-treatment' condition. A nominal no-treatment resulted in significant changes in pre- to post-test performance on six teaching behaviours, which suggests some systematic effect from regular professional studies. Moreover, in several instances these changes were of equal magnitude to those resulting from microteaching treatment. Once again, however, the specific results lead to the conclusion that micro-teaching is a superior treatment for developing what might be called the criterial questioning skills (see above). Microteaching appears superior, also, in helping student teachers to increase unsolicited pupil answering and pupil-to-pupil exchange of ideas.

In contrast, results in the current study show that observation-analysis and regular coursework were equally effective in bringing about change on all but four of the nineteen dependent variables examined. With a few minor exceptions, then, it can be concluded that observation-analysis is, on average, unlikely to add

much to the effectiveness of the ordinary Teachers College programme of lectures and tutorials.

Finally, it is important to note that curriculum in the present study was adequately controlled in the case of microteaching and observation-analysis, but that the no-treatment group did not get any experience in coding and analysing teaching samples. It could be argued, therefore, that the superiority found for microteaching over regular coursework resulted from differences in course content rather than from the teaching procedures used. Conclusions concerning the relative effectiveness of regular coursework and the other two treatments are thus more hazardous than those related to a comparison of microteaching and observation-analysis.

The major conclusion which can be drawn, then, is that a composite of different pupil, media and question practice treatments in microteaching is, on average, likely to be more effective than just observation-analysis for helping student teachers establish control of questioning strategy in discussion lessons. Although microteaching in the present study did not unduly emphasise teaching practice, it seems that the combination of this activity with the use of interaction analysis to provide feedback on peers' teaching, as well as to evaluate one's own performances, gave microteaching special advantages over observation and analysis of teaching samples alone.

Thus, in line with the findings in some previous microteaching research (Flanders, 1970; Traill, 1971; McIntyre, 1972; Brisling and Tingsell, 1973; Thew, 1973; Freyberg *et al.*, 1974; Brown, 1975), the present study attests to the importance of interaction analysis in microteaching for sensitising participants to behavioural repertoire, as a form of discrimination learning, and as a means of providing informational feedback on which to base possible modifications to teaching behaviour. Furthermore, most micro-teachers felt that interaction analysis feedback should come from their microteaching group and lead to independence in deciding how to modify or develop teaching style. This supports the observation of other researchers that peer supervision is very acceptable (Belt, 1967; D.A. Young, 1970; Guelcher *et al.*, 1970), and that students prefer advice from trained supervisors to be mainly on a request

basis (Johnson and Knaupp, 1970; Foster *et al.*, 1973; Levis *et al.*, 1973; Freyberg *et al.*, 1974).

Comparing Video and Audio Support for Microteaching

The second major focus in the investigation stemmed from an interest in developing an equally effective, but less expensive, approach to the common practice of using videotape procedures as part of microteaching programmes. Accordingly, the Part 2 research design was specifically aimed at exploring the relative effectiveness of audio and video support for microteaching, both treatments being otherwise balanced for two pupil and two question practice treatments. Again, in the interest of identifying educational programmes that are as economic as possible regarding resources and labour intensity, these two microteaching treatments were also compared with video and audio treatments in observation-analysis, and with regular professional coursework.

The outstanding feature of this section of the results is that the two balanced media treatments in microteaching were equally effective in producing change on the same sixteen teaching variables for which their combined treatment produced change in the Part 1 research design. Logically, therefore, it could be inferred that substituting either of these two treatments for the combined treatment would have produced a similar pattern of superiority over observation-analysis and no-treatment. Direct comparison of these treatments through the second design, however, provided a clearer picture of their relative effects.

First, both media treatments in microteaching were significantly more effective than observation-analysis with video in helping student teachers develop control of those questioning skills which tend to promote pupil thinking: in stimulating fewer and more searching episodes through the use of probing questions; in initiating and sustaining episodes with high order questions; in reducing the amount of teacher talk; and in keeping the incidence of yes/no questioning to a minimum. Although this superiority was not so marked in the case of observation-analysis with audio, the inference cannot be made that observation and analysis of audiotaped

teaching samples is superior to analysing videotaped samples. As detailed in Chapter 8, the only statistically significant difference found from a direct comparison of these two media treatments involved the superiority of the audio treatment for increasing probing tendency.

Secondly, the findings suggest a superiority for both video and audio microteaching over regular coursework in professional studies that is not matched by the media counterparts in observation analysis. In only two instances was there significantly greater effect for observation-analysis: both media treatments were superior to the regular programme of lectures and tutorials in improving fluency-control in questioning, while audio observation-analysis was superior in promoting fewer discussion episodes per lesson. The two media treatments in microteaching, on the other hand, were both superior to regular coursework in causing change on approximately half of the nineteen dependent variables in the study, most of these involving questioning skills that are conducive to higher level pupil thinking. In addition, the microteaching with video treatment was superior in increasing probing tendency, while the audio treatment was more effective in producing greater amounts of extended ideas responding as well as spontaneous answering and pupil-to-pupil interaction.

In summary, the main conclusion to be drawn from the above results is that video and audio microteaching are equally effective means of increasing control of questioning skills and talk patterns as these relate to the small group discussion lesson. Another is that video and audio treatments in observation-analysis are generally equal in their effects concerning these same kinds of skills, but that the number of significant changes is likely to fall short of those resulting from video or audio microteaching. Lastly, whereas either a video or audio treatment in microteaching would appear, on average, to be superior to regular coursework in professional studies for developing control of questioning skills and talk patterns, it is unlikely that such superiority could be claimed for either video or audio observation-analysis.

This equivalence found for the two media treatments in micro-teaching lends some support to earlier research along component

skills training lines which has reported (i) no consistent significant differences between video and audio feedback (Hoerner, 1969; Smith, 1969; Boone and Stech, 1970; Doty, 1970; Klingstedt, 1970; Acheson and Tucker, 1971; Gall *et al.*, 1971), and (ii) some advantages for audio over video for modelling purposes (Myrick, 1969; White, 1972). As P.M. Ward (1970) has claimed, the potency of the cheaper audio-recorder has been much underestimated. When micro-teaching focuses on verbal skills such as questioning, it would appear that students do not require the visual stimuli available through video recordings in order to successfully analyse teaching samples, to provide feedback for others, to evaluate their own teaching, or to learn to exercise better control over teaching behaviour.

Comparing Different Forms of Microteaching

Like the second research design, the third design in the study was set up in an attempt to identify the most effective ways of handling microteaching within a Teachers College course. In the interest of easing organisational problems, one question asked was whether peer teaching might be as effective as microteaching children. Concerning economic use of time, another question was whether discussion-leading skills could be acquired equally well by student teachers who practised different levels of questioning, but who observed each other using the level not assigned for personal practice. Lastly, the question of video versus audio support was asked again, but this time because of interest in the relative efficacy of combinations of each media treatment with the various pupil and question treatments.

The third design produced surprising results: all kinds of pupil, media and question practice treatments, as well as their various combinations, were equally effective in causing significant change in pre- to post-test performance on sixteen of the nineteen dependent variables in the study, and were equally ineffective in changing the remaining three. There is always the possibility, of course, that the criterion measures used were not sensitive enough to detect any differences, but if this were so, then the differences would have to be very subtle indeed.

Essentially, then, there was no difference in the pattern of results for any given treatment in the third design and that found for all of these treatments combined as represented in the Part 1 design (microteaching as a whole). Logically, therefore, it can be concluded that the addition of any one of these treatments to a Teachers College programme in order to develop students' questioning skills, would be likely to produce superior results to regular coursework alone, or to this coursework combined with observation and analysis of teaching experience.

The equal effectiveness found for teaching peers and teaching children is of special interest because peer teaching reduces the logistic pressures and cost in providing a microteaching programme. Furthermore, this finding tends to belie the claim made by some investigators (Steinbach and Butts, 1968; Wood and Hedley, 1968; Allen and Ryan, 1969; Johnson and Pancrazio, 1971; Foster *et al.*, 1974) that peer teaching is artificial, too risk-free, and prevents adequate transfer of teaching skills from the microteaching laboratory to the classroom setting with children. Indeed, although one-fifth of those students who taught peers agreed that teaching children would have been a more helpful experience, the large majority had no problems in teaching their fellows, expressed no diminution of interest as their programme proceeded and, like participants in a recent study by Levis *et al.* (1973), felt that serving the multiple rôles of pupil, observer-coder and provider of feedback helped to sensitise them to a wider repertoire of skills and to ways of handling particular teaching problems.

The suggestion here that skills may be acquired through observation and providing feedback on others' teaching is also well illustrated by the equal effects found for the two question practice treatments. Microteachers who practised middle order questions but who coded, analysed and gave feedback to others in their group practising high order questions, performed just as well on both types of questions, and in all other questioning-related skills, as did those who practised high order questions and observed use of the middle order variety.

Thus, although the practice of specific skills is usually regarded as the *sine qua non* of a sound microteaching programme,

findings in the present study reinforce the theoretical viewpoint expressed in several other studies (Goldthwaite, 1969; McIntyre, 1972; Freyberg *et al.*, 1974) that control over teaching skills can be acquired just as well by 'vicarious' learning. As observed in a preliminary study to the present research (Freyberg *et al.*, 1974), this 'vicarious' learning of unpractised skills appears to be facilitated by coding, analysing and giving feedback on use of the skills by others. It is suggested that these skills are often already part of a person's behavioural repertoire, and that coding–feedback activities help to elicit them in a teaching context. In practical terms, of course, the findings on 'vicarious' learning suggest that time savings could accrue if a Teachers College were to organise its microteaching programmes on a "part-practice/part vicarious learning" basis.

Conclusions relating to the equal effects found for video and audio treatments in microteaching have been outlined in the preceding section and will not be commented upon here, except to note that results in the third research design extended the equivalence of the two treatments to their interaction with all pupil and question practice treatments in the study.

Of special interest are the attitudes expressed by students towards their microteaching experience. No matter what their particular pupil, media and question practice treatment, students were equally convinced that microteaching is an effective and very necessary learning experience for all prospective teachers. Furthermore, there was much support in all treatment groups for the emphasis in a sensitisation model of microteaching on (i) freedom to explore alternative ways of handling clusters of interrelated skills as opposed to the practice of one-skill-at-a-time; (ii) non-judgmental and non-directive supervision; and (iii) independent decision-making concerning teacher behaviour and teaching style.

These attitudes, together with the experimental results on teaching performance outlined earlier, are highly encouraging concerning the inclusion of microteaching along sensitisation lines in a Teachers College course. Furthermore, with reference at least to developing questioning skills in the small group discussion lesson, findings in the present study suggest that a microteaching programme

could be provided economically and successfully by (i) substituting more easily organised peer teaching experiences for the teaching of children; (ii) substituting the readily available and less expensive audio-recorder for video equipment to support analysis of teaching and feedback activities within the microteaching format; and (iii) having students explore some skills through direct practice, while acquiring others 'vicariously' through observing them being used by fellow microteachers. It seems likely that this kind of programme would help students to develop sensitive and flexible control of questioning strategies, and that this would be achieved more effectively than either through regular coursework in professional studies alone, or through supplementing this coursework with observation and analysis of teaching activities.

This is not to say, of course, that other combinations of pupil, media and question practice treatments in microteaching would be inferior. On the contrary, the equal effectiveness found for a variety of programmes in the present investigation indicates the flexibility of choice that is potentially available to a Teachers College, depending upon its particular resources.

Questions Raised by the Study

In the course of the present study, the need for further research into a number of specific aspects of the sensitisation approach to microteaching became clear.

One of these questions concerns generalisability for the finding that the use of peers and children in microclasses are equally effective procedures. In other studies reporting a similar result (Collefello, n.d.; Hoerner, 1969; Doty, 1970; Levis *et al.*, 1973), most student teachers have nevertheless expressed a preference for working with genuine school pupils. That this preference was not strongly apparent in the present study may reflect the fact that the subjects were senior students who had already experienced practice teaching in schools, and who viewed peer teaching as a safe opportunity to review, improve and refine their teaching skills.

However, equivalence for the two microclass compositions in the present study refers to one teaching mode only. It is possible, as Steinbach and Butts (1969) have suggested, that some skills and some teaching modes can be learned only by teaching children. Again, most impact for microteaching may come from building initial confidence and competence through teaching a small group of peers, leading on then to teaching somewhat larger groups of children, and culminating with practice teaching in schools (Steinbach and Butts, 1969; Emmer, 1971). Alternatively, Clift *et al.* (1974) have argued that the need for school pupils in microclasses may be less important as the characteristics of the peer class approach those of the target pupils; that is, peer teaching may be appropriate when subsequent teaching is to be with high school seniors. Further investigation of the microclass composition variable within the context of a sensitisation model of microteaching could produce valuable guidelines as to precisely when the more expensive, and more difficult to organise, teaching of children should be preferred to peer teaching.

A second line of investigation centres on the generalisability of the finding that video and audiotape are equally effective means of supporting analysis of teaching and feedback activities in the microteaching format. Earlier, it was suggested that audiotape support is probably sufficient when a microteaching programme focuses on verbal skills such as questioning, the implication being that video recordings are likely to be of greater assistance to student teachers when the teaching mode to be practised includes an emphasis on non-verbal skills (c.f., Gall *et al.*, 1971; Hiscox and Van Mondfrans, 1972). This proposal, however, needs to be empirically checked across a variety of teaching modes instead of relying for its validity on *a priori* bases.

Research comparing the use of video and audiotape in microteaching might also embody a closer examination of the self-confrontation process than was undertaken in the present study. Some researchers have argued (Baker and Fuller, 1972; Clift *et al.*, 1974) that self-confrontation through video replays of teaching performance may result in emotional reactions by student teachers that are damaging to their personal and professional growth. The majority view of microteachers in the present study, however, was that self-confrontation — by video or audio means — presented no special

problems and was a valuable learning experience. This positive response may relate to certain features of the sensitisation approach to microteaching which contrast with the training orientation of most programmes in the research literature: the avoidance of comparisons between student teacher performance and standards of 'good' teaching; freedom to explore teaching alternatives in one's own way; and the non-judgmental posture adopted by peers and supervisor alike during feedback discussion sessions. Nevertheless, before one can be fully confident about the validity of such a claim, research is needed into the more deep-seated attitudes of student teachers about the self-confrontation process: these attitudes would need to be explored by more than just the type of questionnaire used in the present study.

A fourth problem concerns the viability of vicarious learning as a means of making time savings in the provision of microteaching programmes. In a preliminary study to the present research (Freyberg *et al.*, 1974), no significant differences were found in the performance of questioning skills by two groups of in-service teachers who practised memory questions and high order questions respectively. However, those teachers who practised only memory questions objected to being assigned to what they considered to be an inferior teaching skill, while both groups felt that all teachers should have been allowed to practise both types of questions. The motivational problem inherent in these remarks was avoided in the present pre-service study by (i) using middle order and high order questions as the two practice conditions, and (ii) inviting all microteachers to practise all other questioning-related skills in the curriculum provided. Yet considerable time savings can only be made in a microteaching course when vicarious learning is extended to a wide range of skills. Studies are required across a range of teaching modes in which only some of the participants in a group practise at all, while the remainder simply observe, code, analyse and provide feedback on that teaching. In short, research into vicarious learning needs to be more bold in its scope than was employed in the present study.

A further question raised during the investigation centres on problems of measurement. It must be recognised that the ratio measures developed in the study to assess the questioning skills and

talk patterns of different treatment groups do not embrace all of the possible sequences for strategy and tactics explored by micro-teaching and observation-analysis participants. Nor could these measures provide a definitive answer as to whether or not micro-teaching is superior to other treatments in the study in helping students to gain all-round competence in teaching. It can be claimed that the SQUAIES Interaction Analysis Coding System provided microteaching and observation-analysis participants with a useful depiction of the sequential nature of the teaching process and, moreover, this analysis system readily generated pragmatically-useful ratio measures relating to particular skills. But how the SQUAIES system might be used to measure and compare larger sequential patterns in teaching is a matter for future research.

An allied problem concerns how best to measure the logical content of teacher-pupil verbal interaction. A number of studies have attempted to assess the effect of microteaching on a teacher's ability to "improve" pupil responding, by using such measures as increase in mean lines of transcript per pupil response, or increase in the mean number of words per pupil response. Because little, if any, relationship appears to exist between these kinds of measures and substantive thinking, the SQUAIES coding system developed for the present study included an alternative measure involving a count of the number of substantive ideas in each pupil response. A weakness of this measure, however, is that it does not identify the appropriateness of the substantive and logical content of a pupil response in terms of preceding questions and remarks by the teacher and/or other pupils. Nor does it indicate successful or unsuccessful transitions by pupils from one logical thought level to another as was researched and measured by Taba *et al.* (1964). Further research on the viability of the SQUAIES coding system for use in teaching experiments would do well to attempt to overcome these measurement gaps.

Finally, the surprising result showing equal effects for all kinds of microteaching treatments, gave rise to two questions which were followed up on a small-scale basis subsequent to the main study. One of these questions was whether the control of skills shown by microteachers in their post-test lessons would persist over time.

In an attempt to answer this question, approximately four months after post-testing, twelve students were asked to take a further 10-minute discussion lesson based on a story having a similar theme to those used for pre- and post-testing. Once again, the directions emphasised the goal of using questioning skills to help pupils think. The students in this follow-up study were those who had participated in the video-children treatment in microteaching (half practising middle order and half practising high order questions), and they taught the same five children who had made up their microclasses during the treatment phase in the main study. All lessons were audiotaped and transcribed for analysis, but on this occasion, SQUAIES coding was completed by the investigator alone. The results of paired sample t tests for difference between post and post post-test performance indicated that this group of microteachers retained the high degree of control over teaching skills that was evident in their post-test lessons (TABLE 9.1: p.355). The only significant differences in teaching performance concerned a slight reduction in using pupil ideas and structuring with questions, as well as some increase in the incidence of one idea pupil responses. Thus, for this group at least, the sensitisation approach to microteaching had resulted in a high level of stability for skills acquisition.

The second follow-up study concerned the possibility of differential effects for treatments as the result of aptitude treatment interaction (ATI). A comparison was therefore made of the teaching performance of students in the high and low dogmatism categories which had been used in the main study for stratified random sampling and allocation of subjects to treatments. Unfortunately, the comparison had to be limited to the Part 1 design (microteaching, observation-analysis and no-treatment), as cell numbers would have been too small (n = 3) to permit reliable statistical inferences in the case of the full Part 3 design.

Application of factorial MANOVA procedures (two levels of dogmatism and three treatment levels) to students' pre- and post-test performances showed that there was a main effect for the treatment factor, but that there was no main effect for dogmatism, and no

significant interaction of dogmatism with the treatment factor.[1] Thus, unlike the suggestion in the teacher education literature that highly dogmatic persons tend to resist behavioural change (see, for example, Hanny, 1967; Johnson, 1967; Ober, 1967; Cappelluzzo and Brine, 1969; Johnson, 1969), students classified in the present study as high on dogmatism score made similar performance changes to those made by students in the low dogmatism category.

Concerning, in particular, the substantial performance changes made by microteachers classified as high on dogmatism, it is tempting to conclude that these changes were due to the special nature of the microteaching programme that was provided: its emphasis on freedom to explore teaching skills, unhampered by the judgmental feedback and external control that is inherent in programmes which incorporate imitation of teacher models and supervisory critiques. But such a conclusion must be tempered by the observation that significant, though less substantial, performance changes were also made by observation-analysis participants who were classified as high on dogmatism. One plausible explanation for this is that, like microteaching, observation-analysis emphasised sensitive control of repertoire as representing competent teaching, rather than attempting to force students to adopt teaching approaches. However, a variety of other factors might explain the findings: for instance, level of dogmatism, as a presage factor in teaching experiments, may be a less important correlate of behavioural change than other personal characteristics; or the findings might have been different had sampling included only those students who were extremely high, or extremely low, on dogmatismscore. In the context of the present study, therefore, no firm conclusions appear to be warranted concerning aptitude treatment interaction. There is a general need, however, for further research in microteaching which concentrates on ATI. If differences in personality characteristics or learning styles do affect student teacher response to various kinds of educational programmes, then it seems important to be able to

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1 Pre-test: Dogmatism $p \leq .07$; treatment $p \leq .48$; dogmatism × treatment $p \leq .40$.
Post-test: Dogmatism $p \leq .09$; treatment $p \leq .001$; dogmatism × treatment $p \leq .80$.

identify those students who can most readily benefit from some programmes but not from others.

Concluding Remarks

This study was a response to the investigator's observation that, despite efforts at Hamilton Teachers College to assist students to become more flexible and insightful teachers, many students appeared to lack the behavioural repertoire and control to be able to vary teaching strategies in specified ways, and to adapt their teaching behaviour to new circumstances as these arose.

Two features of student teacher performance in the study tended to confirm this observation. First, although students were directed in pre-test teaching to use questioning skills mainly with the objective of helping their pupils to think rather than simply to remember, students' questioning was generally of such a low cognitive order that this teaching objective could not be achieved. This was in spite of the fact that a list of appropriate cues to high order questions had been provided. It was also in spite of the fact that pre-testing had been preceded by three major required courses, all of which had given attention to questioning skills (these were Year 2 courses in Learning and Teaching, Teaching Language and Teaching Mathematics).

Secondly, the picture presented in the pre-test situation was largely repeated in the post-test performance of those students in the study who were allocated to a nominal 'no-treatment' condition (regular coursework only). In other words, the programme of lectures and tutorials which continued into students' third and final college year did not appear to have helped them to overcome the problem of repertoire control with respect to questioning strategy.

These negative features apart, however, a promising finding to emerge from the study is that the addition to regular coursework of sensitisation experiences in microteaching can help student teachers exercise flexible control of questioning strategies. Furthermore, if peer teaching, audiotape support and vicarious learning procedures are adopted, it appears that a Teachers College can mount a

successful microteaching programme with considerable economic efficiency.

If skill in handling questioning strategy is assumed to be an important teaching competency, then one obvious implication of the present results is that a required learning experience for all Hamilton students should be the microteaching programme which was developed.

On a more general level, the study provides some empirical support for the sensitisation approach to microteaching as a viable alternative to the behaviouristic orientation of the classical Stanford model. Indeed, if the theoretical assumption is accepted that general teaching competency involves sensitive and flexible control of a wide repertoire of teaching modes — themselves drawn from various philosophical and psychological conceptions of education (see Chapter 2) — then it is important that sensitisation programmes relating to such modes should be produced and empirically tested for their possible adoption by Teachers Colleges.

The introduction of a number of these programmes into a Teachers College course would no doubt give rise to some scheduling problems. For example, it is significant that despite having identified in the present study an economic way of organising microteaching, the most frequently mentioned student recommendation for improving the questioning skills programme was simply to increase its length to afford more practice opportunities.

A more central concern, however, would be to gain a measure of staff support, both in the Teachers College and in its Associate Schools, for the repertory definition of teaching competency and for the open-ended learning experiences which characterise the sensitisation model of the microteaching process. Acceptance of these features would be essential to the successful integration of course-work, microteaching and school practice, such that students could freely experiment with the theory and practice of various teaching modes, at first in relatively discrete lessons, and ultimately in relation to the broader framework and longer-term objectives of curriculum units.