MPhil/93

OOK

Sale

Hep.

THE DEVELOPMENT OF AN INTERACTIONIST EVALUATION METHODOLOGY.

Jane Susan Johnston.

A thesis submitted in fulfilment of the requirements of The Nottingham Trent University for the degree of Master of Philosophy.

September 1993.

CONTENTS.

ABSTRACT.

This is an account of the development of an evaluation methodology termed Interactionist Evaluation.

Interactionist Evaluation was developed to effectively evaluate the quality of in-service science courses within Trent Polytechnic (now The Nottingham Trent University) and to ascertain their long term impact on the development of primary science within schools. The evaluation methodology was influenced by the complex interactions with and within schools and the in-service courses and by other qualitative evaluation models. Its development attempted to encompass the needs and difficulties of course evaluation as experienced during the initial evaluations. It represents a novel form of evaluation, not described in the literature, and extends the possibilities of course evaluation.

In Interactionist Evaluation the evaluator is committed to the aims of the course being evaluated and participates in the course to establish good working relationships with course members. Subsequent interaction in the school context supports the aims of the course in relation to teacher and child development and attempts to enhance the quality of both by observing the teacher in action and engaging them and other staff in educational conversation. It is the form and intentions of this interaction which establishes Interactionist Evaluation as a distinct evaluation methodology. It recognises three different forms of interaction and uses interaction in a positive way to achieve agreed aims. In this way evaluation interaction is able to contribute to the success of the courses and their long term impact, rather than being a negative influence to be accounted for.

In Part 1 of this thesis, the influences which acted upon the developing evaluation methodology are discussed. This is followed in Part 2 by a closer look at one of the major influences, the interactions with schools. Each case study represents an important influence on the methodology and this influence is discussed together with the effectiveness of the developing evaluation methodology on primary science within the school. Part 3 looks closely at the characteristics and techniques of the resulting evaluation methodology.

1. INTRODUCTION

This thesis attempts to document the evolution of a novel form of evaluation, termed Interactionist Evaluation. The focus for the evaluation methodology described later began during 1985, when the D.E.S. Primary Science Consultants' Course at Trent Polytechnic (now The Nottingham Trent University) was run in response to the D.E.S. circular 4/84. From the outset, evaluation was deemed to be an essential element of the course for, as McCabe (1980) has said, there is a need to examine at every stage what goes on in in-service work and to pass the results on to all concerned so that work in this area can be made as effective as possible. More recent D.E.S. circulars (D.E.S. 1987) have re-emphasised the importance of monitoring and evaluating in-service provision, as did the D.E.S./N.F.E.R. study to evaluate twenty day science and mathematics in-service courses (D.E.S. 1991, Harland and Kinder 1992).

The primary science in-service courses at Trent Polytechnic (now The Nottingham Trent University) which form the basis of this evaluation were the 35 day courses run in response to D.E.S. circulars 4/84 and subsequent circulars 3/85, 1/86 and 9/87 (see footnote [1]). The courses and their evaluation (Johnston 1986, 1987, 1988, 1989) are described more fully in Part 2.

As the appointed evaluator for the courses my brief was that the major concern of the evaluation was formative, that is, critical feedback of the development of the course. I duly embarked upon an evaluation of the quality of the course in terms of such issues as materials, resources, motivation, as well as the immediate impact within the school context. My ideas concerning evaluation methodology were influenced by my scientific background. Evaluation was an objective procedure, which could collect data from different participants who had undergone the same experiences and had the same factors affecting their performances. In this model the role of the evaluator was characterised by detachment and objectivity, rigorously analysing the quantitative data collected. This was a very naive idea, which did not take into account the differing factors which affected the individuals concerned. In some respects I was attempting to work in a quasi-experimental way. A quasi-experimental evaluation methodology has been outlined by Benson and Michael (1987), and involves the control of variables to a greater or lesser extent. I was however assuming that all variables outside of the

---

[1] The evaluation used schools who were involved in the following courses run at Trent Polytechnic (now The Nottingham Trent University).
1985-86 D.E.S. 4/84 Primary Science Consultant's Course.
1986-87 D.E.S. 3/85 Primary Science Consultant's Course.
1987-88 D.E.S. 1/86 Primary Science Consultant's Course.
1988-89 D.E.S. 9/87 Primary Science Consultant's Course.

course itself did not affect the data and that all teachers were subjected to the same influences on the course. Additionally I had not considered the difficulties of controlling variables in a social context, or even that there were any variables to control. The factors subsequently found to affect the data are described more fully in paragraph 1.4 and are illustrated in Figure 1 (see page 13).

The evaluation strategy, was outlined in the report of that first year (Johnston 1986) and included the following;

Practice - collection of data.

a) A brief initial statement from each member on their expectations of the course, requested on Day 1.

b) Observations of involvement during the course.

c) Questionnaires ascertaining course members' perceptions of the quality of the course.

d) Evaluation discussions, individual and group.

e) Examination of materials produced by teachers over the period of the course.

f) School visits.

This strategy was affected by a complex of influences which together played a significant part in the development of Interactionist Evaluation.

1.1. THE DEVELOPMENT OF CASE STUDIES.

The first influence involved changes made to the evaluation by the course steering committee who at the beginning of the 1986-1987 course felt that the quality of the course, having been modified as a result of data received from the evaluation, was well matched to its purposes and that the future evaluation should concentrate primarily on the impact, both short and long term, individually and within the school context. This change meant that the scope of the evaluation was wider and consequently it would be difficult to collect quantitative data to ascertain the impact of the course. It was therefore decided to focus on a small number of schools and present the data in a case study format.

1.2. THE ADVANTAGES OF CASE STUDIES.

Some of the advantages of case studies as outlined below complement Interactionist Evaluation as described in Part 3.

1.2.1

Case studies present an insight into the concerns relating to the school, children, classroom, classroom teacher and headteacher involved. As Adelman, Jenkins and Kemmis (1976) feel they are "strong in reality", being involved in the everyday reality of teachers and the context in which innovations are attempted. This is thought (Crossley & Vulliamy 1984) to enable case study researchers/evaluators to identify the constraints on innovation. Stenhouse (1979) believes that, through case studies, researchers can study curriculum innovation as well as collect data.

1.2.2.

Walker (1983) and Bell (1990) believe that the insight case studies offer the evaluator are not limited to the subject being researched and decisions regarding future action but, they can offer a means of integration across the social sciences by highlighting hidden curricular, informal social structures and unintended consequences of actions. This is because they use a social process to study social behaviour and this in turn leads to a social product (Macdonald & Walker 1975).

1.2.3.

Case study research is thought by Macdonald and Walker (1975) to not only involve the descriptions and testing of current theories but be able to generate theory as well. Stenhouse's (1979) belief that case studies offer an opportunity to study curriculum innovation without the loss of data which accompanies more traditional researches is upheld by Crossley and Vulliamy (1984) who believe that case studies need not be purely descriptive but can be comparative and lead to important modifications in educational practice. Adelman, Jenkins & Kemmis (1976) suggest that by beginning in the world of action, case studies can subsequently contribute to it.

1.2.4.

The main strength of case studies is felt by Crossley and Vulliamy (1984) to lie in the "maximisation of ecological validity of data" a concept conceived by Bracht and Glass (1968). Ecological validity puts data into the total context from which it has been acquired. This includes the complex interaction of variables (see Figure 1 page 13) which can not only be recognised through case studies but can be represented in context

(Adelman, Jenkins & Kemmis 1976). Crossley and Vulliamy (1984) feel that questionnaires and brief fact finding visits cannot achieve ecological validity because a large amount of data will be concealed for fear of blame or failure.

1.2.5.
Case studies present data in a manner which is easily and generally more accessible and therefore as Adelman, Jenkins and Kemmis (1976) indicate they can serve a multiple audience.

1.3. SOME OF THE PROBLEMS OF CASE STUDY RESEARCH AND POSSIBLE PRACTICAL SOLUTIONS.

The problems described here had to be considered and solutions sought at the start of, and during, the evaluation described in this thesis.

1.3.1.
A major concern of evaluators conducting case study research is that it is not rigorous enough. Yin (1984) believes that this may in part be due to "sloppy" research techniques. Macdonald & Walker (1975) and Burgess (1985) recognise the desire to be more scientific, coupled with the genuine scepticism about the value of case studies even by those conducting them. However, Walker (1985) feels that to give into demands for more rigour could be to

"commit methodological violence on substantive issues and concerns" (p.8).

A number of criticisms concerned with rigour stem from the problems of organising case study research. Adelman, Jenkins & Kemmis (1980), question the degree of access the researcher has to necessary data and the validity of the data collected.

Data problems are recognised by Walker (1980) in terms of the selection and the quality of data. Too much, may result in some wastage of valuable data while too little data may mean that the total picture can rarely be accurately perceived.

Parlett (1980) and Yin (1984) stress the need for evaluators to lay out a variety of methods of investigation and analysis bearing in mind the importance of being self critical and reflexive in order to overcome problems associated with methodology. Parlett (1980) also stresses the need for detailed methodologies and research design prior to the evaluation commencing. However, as Macdonald and Walker (1975) have identified, few research practitioners begin their research with the necessary skills to enable them to develop effective methodologies. The dual nature of Interactionist

evaluation, considering the quality of the courses and the long term impact within the school, which evolved from these case studies and which is discussed later in this thesis is advocated for case study research by Vulliamy, Lewin and Stephens (1990). In fact Walker (1983) and Yin (1984) stress the danger of relying excessively on any one method or technique as this can provide a biased view of the case being studied. Walker (1983) also feels that the conservative nature of most case studies does not take into account the fluid, mobile nature of most schools. Validity of data can be safeguarded by the accessibility of a research database (Yin 1984). This is a compilation of the data collected which can be referred to and analysed more fully if needed by outside audiences. In this thesis much of the data collected was recorded in the form of school visit notebooks and questionnaires, but school policies, discussion documents and letters are also included. These are referred to in this thesis and examples are set out in Appendices 3 to 9. All the data collected during evaluations and used during this thesis has been collected in a research database and is available for scrutiny if required. The contents of the database are described in Appendix 1.

Another technique of use in validating case study data (Adelman, Jenkins & Kemmis 1976) is triangulation, that is the use of others to verify or refute data analysed in order to overcome the problems associated with qualitative research. Triangulation is a technique used in Interactionist Evaluation (see also Figure 2 page 16 and 4.2.2) where it can take two forms. The first is concerned with the verification of data between schools or course members. An example of this is a theory which emerged from the evaluation (and discussed in case study 1 see paragraph 3.3), that the course, during the initial year, lacked relevance to Infant teachers. This idea was first raised during a school visit and is described in the 4/84 evaluation report (Johnston 1986 page 13). This area of concern was then discussed during an evaluation session with other course members from Infant schools who felt

" that the course could have had a great deal more content applicable to them"

(Johnston 1986 page 13).

The second form is concerned with verifying data collected within a school, that is data collected from one teacher verified with the headteacher or another teacher within the school. An example of this is given in case study 2 (see paragraph 3.4) when the headteacher's lack of commitment to science was raised by the course member who was

"pessimistic re HT commitment and feels it is simply window dressing".

(see 1/86 school visit notebook in research database).

I discussed his expectations of the course during the initial visit to the school and wrote in the school visit notebook

"The head is very impressed with the standard of science within Infant school (on 4/84) and feels Junior school falls down in providing further development"
(see 1/86 school visit notebook in research database).

This apparent commitment was explored further during this and other visits when the headteacher acknowledged his expectations that the course member would "develop a science policy/document for use with whole school" but "due to little release time to visit other classes/assess etc. staff had not agreed upon a policy".
(see 1/86 school visit notebook in research database).

Triangulation here identified a discrepancy in the headteacher and course member's perceptions regarding support and this could be explored further.
In this way, if properly used, triangulation should prevent the problem identified by Walker (1980) that the evaluator may not present a true picture if unexpected data arises.

Another useful technique in helping to validate data is the compilation of the data from case studies into tables (see Tables 1 and 2 pages 90 and 91). This allows data from multiple sites to be compared. Two such tables are used in this thesis. In Table 1 (see page 90), the problems experienced in evaluating the key areas of development [2] from different schools involved in the case studies are compared and examples are given. These key areas are ones which the courses attempted to develop and were therefore chosen for an evaluation focus. Table 2 (see page 91) looks at the effectiveness of the interaction on the development of these key areas within each case study. These comparisons can assist verification of theories which emerge from the the case study data and help when validating the individual analysis within the case studies. These Tables will be considered later in the thesis.

1.3.2.

The ethics of case studies feature largely among the perceived problems (Macdonald & Walker 1975 and Adelman, Jenkins & Kemmis 1976). Concern arises over ownership of the data which includes the right of others to view, comment or suppress

---

2
Development of a school policy for science
Organisation of scientific investigations.
Organisation of resources.
Matching of science activities to children's abilities.
Assessment in science.
Staff development in science.

data. Stenhouse (1975) believes that ownership should belong to the teacher and that all research should begin and end in the classroom. Parlett (1980) feels that a contract between the researcher and the audience is required and in this way issues such as ownership and purpose of the evaluation, whilst considering the need for confidentiality, can be addressed. A further problem may arise because of lack of knowledge about whom the evaluation is for and about the wider audience for reports. This knowledge could be important when decisions about ethics, especially concerning confidentiality, and ownership, are being made. Macdonald (1974) believes that case studies should be made available to those concerned and a much wider audience. The use of collaborative qualitative research as advocated by Vulliamy, Lewin, and Stephens (1990) and Bell (1990), that is, the "democratic" involvement of participants (Macdonald 1974 and Bassey 1986), firmly based in practice, should overcome concerns of ownership and enable the non-specialist audience to make sense of the data. Macdonald and Walker (1975) feel that if the evaluator is representative of the wider groups studied and is involved in exploring their hypotheses, then describing their realities will be easier. Collaboration should take into account the need to preserve the anonymity of those supplying data. It may be that valuable data has to be withheld or the evaluator will permanently damage confidentiality with a subsequent loss of data. The decisions made regarding accessibility of data in the evaluations, described in Part 2 of this thesis, are discussed in paragraph 3.2.1.

1.3.3.

The importance of good relationships in conducting evaluations as advocated by Denscombe (1983), Hitchcock (1983), Measor (1985) and Benson and Michael (1987), is discussed later in 4.1.3. Its importance has been recognised in case study research (Walker 1985 and Vulliamy, Lewin & Stephens 1990). Factors affecting the formation of good relationships include the evaluator's position and the subsequent effect that this may have on the data (Parlett 1980). Also of importance is the amount of time and access available to the evaluator, limitations of which are felt (Adelman, Jenkins & Kemmis 1976) to affect the validity of the data acquired. A third factor identified by Kemmis and Rowbottom (1981) is the evaluator's personality which may have a profound effect on the negotiation of access, confidentiality and ownership. This is also discussed later in 4.3.1.

1.3.4.

Walker (1985) stresses the importance of negotiation beyond the point of obtaining access because in many cases such negotiation can lead to substantive changes. He also says that the evaluator is often the most changed by the evaluation and has the most

to lose, and this could cause problems of objectivity unless verification by others is used. Negotiation and triangulation should ensure that the evaluator has not misinterpreted data or been manipulated by others (Biott 1981).

The involvement of any school in a case study inevitably involves intervention however unobtrusive (Parlett 1980), and uncontrolled (Walker 1983). Adelman, Jenkins and Kemmis (1976) feel that this may interfere with the responsibilities and obligations of the school and indeed have later repercussions (Walker 1983). However Bell (1990) believes that without intervention (which in the case studies discussed here I argue is more negotiated interaction) and reflection, planned change is not possible.

1.3.5.

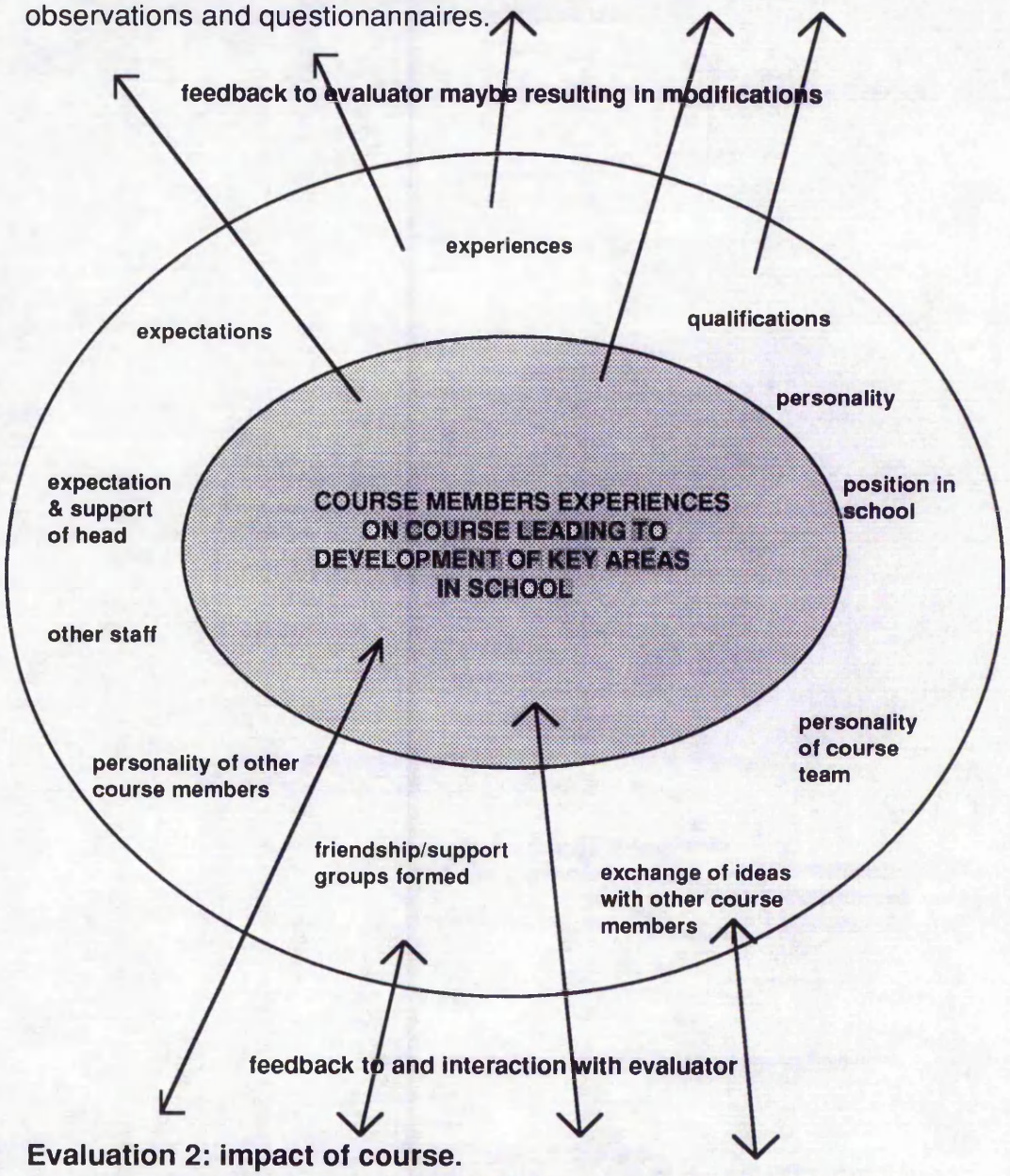
Yin (1984) acknowledges the complaint that case studies are often very lengthy and result in "massive, unreadable documents". I recognise this as a problem that the original evaluations (Johnston 1986, 1987, 1988, 1989) had to accommodate.

1.4 FACTORS AFFECTING THE EVALUATION.

The second influence concerned fulfilment of the expectations of the evaluation. The changes to the evaluation brief have been described in paragraphs 1 and 1.1. The evaluation began as a single evaluation looking at the quality of the courses by identifying the professional needs of teachers and monitoring the effects of the courses in catering for these needs. As a result of the steering committee's decision to expand the evaluation brief as described in paragraph 1.1 the evaluation changed to a dual evaluation, monitoring the quality and looking at the long term impact of the courses in the school context. However, it was obvious from an early stage (Johnston 1987) that monitoring the quality of the courses would not be as straightforward as originally anticipated. Considerable flexibility needed to be written into the courses to suit individual course members' needs, experiences and situations and to enable the courses to be successful in their aims. This was because of the multiple influences which affected the course and the course members (see Figure 1 page 13).

FIGURE 1: EVALUATION STRATEGY, SHOWING EVALUATOR AND OTHER INFLUENCING FACTORS.

Evaluation 1. quality of course.
Evaluator collects experiences about the course via discussions, observations and questionannaires.



Evaluation 2: impact of course.
Evaluator observes, interacts with, discusses with and questions course members, headteacher, staff and children within school during and after the duration of the course.

1.5 THE EFFECT OF THE EVALUATOR.

A third influence involved the interactions with course members and their schools. During these interactions it was difficult to maintain the detached role which I had originally ascribed to the evaluator as I was now involved in the interactions I was monitoring. It was also evident that such interactions themselves, affected the evaluation outcome. As a result, a more naturalistic type of evaluation methodology emerged which has been described by Benson and Michael (1987) as attempting to capture the context in which the evaluation exists, by studying individuals, groups and institutions as they naturally occur. Within this thesis, each case study (see paragraphs 3.3 to 3.7) considers the effect of the context on the evaluation and the describes the effect of the evaluator.

1.6 OTHER EVALUATION METHODOLOGIES.

A final influence was my background reading on course evaluation which made me realise that I was constrained by my scientific ideas and my simplistic view of the role of the evaluator as described in paragraph 1.

I was attempting to conduct a type of classical experimental evaluation. Whilst having the advantages of objectivity and verification an experimental evaluation would have been extremely difficult if not impossible in the evaluation of the long term impact of courses as described here. This is despite evidence to the contrary (Fitz-Gibbon and Morris 1987) because, as McCabe (1980) has said, courses cannot be arranged in an experimental way with a control versus experimental group and, the numerous variables affecting success cannot be taken into account. However a true qualitative evaluation whilst overcoming these problems and considering the varying factors affecting success of courses has problems of verification and objectivity. The main influences on the evaluation methodology are described in paragraphs 2 to 2.7.

1.7 SUMMARY.

These influences and the effect that they had on the development of Interactionist Evaluation are looked at in greater detail in Parts 1 and 2. Part 1 is an exploration of the literature of programme/course evaluation which influenced the developing evaluative methodology. Part 2 consists of a series of case studies which are designed to illustrate the modifications in the evaluation procedure, which resulted from the

interaction with the teachers concerned in order to ensure a more effective evaluative methodology.

Part 3 describes Interactionist Evaluation in detail. I believe Interactionist Evaluation to represent a novel form of evaluation, not described in the literature, which extends the possibilities of programme/course evaluation. Interactionist Evaluation involves a commitment to the aims of the course being evaluated and the evaluator participates in the course to establish good working relationships with course members. In the school context the evaluator supports the aims of the course in relation to teacher and child development, attempting to enhance the quality of both by observing the teacher in action and engaging them and other staff in educational conversation. The evaluation is Interactionist both in the relationship between the evaluator and course members, and in the relationship between work in college and in school.

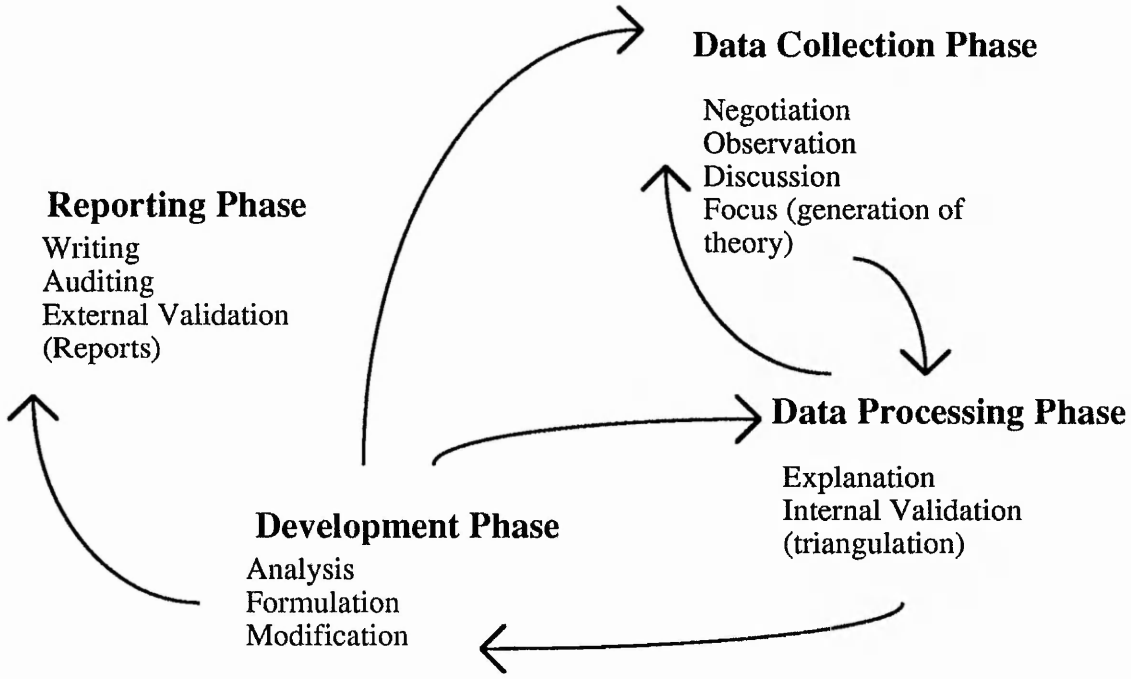
1.8. THE DEVELOPMENT OF AN INTERACTIONIST METHODOLOGY

There were four phases involved in the development of Interactionist Evaluation, which embody the techniques used to develop and validate the resulting methodology and the research events. Each phase overlapped considerably with the others and formed a cycle of events or a research process (see Figure 2 page 16).

The Data Collection Phase was characterised by use the of four key techniques which have become embodied into Interactionist Evaluation (see paragraph 4.2). Negotiation was a necessary starting point. Good negotiation maximises co-operation during the Data Collection Phase and assists access, because without the full support of all participants, success cannot be assured. It is also important to ensure confidentiality is not abused (see also paragraph 1.3.2).

Observation is a key technique used in Interactionist Evaluation and described more fully in 4.2.1. It took the form of observation of participants during course commitments, school visits and in other situations where appropriate. The use of questionnaires was initially of more importance in the Data Collection Phase than it subsequently became in the final evaluation methodology. Questionnaires were able to provide more detail to observations already obtained and focus on specific areas of school and course development. Examples of the questionnaires used can be found in Appendices 3 to 6. Discussion was another key technique, described more fully in paragraph 4.2.2 which was used to focus on specific areas and to uncover new areas for research.

FIGURE 2: THE DEVELOPMENT OF AN INTERACTIONIST METHODOLOGY



The Data Processing Phase involved analysis of the data collected. It occurred alongside the Data Collection Phase because from analysis a theory could emerge and additional data would then be collected to further explain or refute the theory. Verification of the data was assured by the technique of triangulation, a form of internal validation described in paragraph 1.3.1., but data was not collected to prove or disprove pre-determined theories. Examples of emerging theories and of triangulation to verify those theories exist within the case studies in Part 2 and are set out in the research audit in Appendix 10.. The techniques as incorporated within Interactionist Evaluation methodology are described more fully in paragraph 4.2.

The Methodological Development Phase involved further analysis of the techniques and the formulation and modification of the Interactionist Evaluation methodology. Like the other two phases, the Methodological Development Phase forms part of a cycle of events in that, as a result of analysis and development, further data may need to be collected (Data Collection Phase) or processed (Data Processing Phase).

The final phase is the Reporting Phase which involved the completion of the research and documentation of the research methodology. The worth of the research and the evaluation methodology can be ascertained in a number of ways. Data which formed a central part of the research can be tracked through a research audit (see Appendix 10) which shows the key techniques and examples of their use within the data. Additionally the research reports (Johnston 1986, 1987, 1988, 1989) and this thesis allow an outside audience to consider the worth of Interactionist Evaluation. Extracts from the research reports are within the case studies. The complete reports can be found within the research database.

2. PART 1: COURSE EVALUATION - A REVIEW.

This part of the thesis looks at the major influences on the development of an Interactionist role from within existing evaluation methodologies.

My initial ideas regarding course evaluation included the traditional description from Adelman & Alexander (1982), that it was concerned with

> "making judgments about the worth and effectiveness of educational intentions, processes and outcomes; about the relationships between these; and about the resource, planning and implementation frameworks for such ventures."

As my ideas developed I discovered that evaluation methodology was much more complex than I had originally thought. This enabled me to move away from my original simplistic ideas and to incorporate more qualitative techniques into my evaluations to meet the needs of the courses being evaluated.

The idea of an evaluation continuum (Adelman & Alexander 1982) joining the traditional style of evaluation to more recent, less formal qualitative evaluation was interesting and led me to analyse other methodologies and put them along the continuum.

informal.....formal
personal public

qualitative.....quantitative

Responsive evaluation (Stake1975 & 1976)	**Illuminative evaluation (Parlett & Hamilton 1972)**	**Traditional course evaluation**

Qualitative approaches have the reputation for being soft and non rigourous compared with hard, objective and rigorous quantitative approaches (Burgess 1985), but this did not necessarily mean that such an approach was inappropriate for my emerging methodology. Glaser and Strauss (1967) believe that all data, whether it is collected qualitatively or quantitatively, is useful for both verification and generation of theory. It would therefore seem logical to assume that each style of evaluation serves a different purpose and is of use in differing contexts.

The difficulties of conducting an evaluation within a context affected by a large number of differing factors (see Figure 1 page 13) were to some extent alleviated by a more qualitative design which attempted to explain the contextual influences. Burgess (1985) has outlined some characteristics of qualitative evaluations which were found to be useful in the initial phases of the development of Interactionist Evaluation.

1. The researcher works in as natural setting as possible; therefore much of the investigation is devoted to obtaining some understanding of the social, cultural and historical setting.

2. Studies may be designed and redesigned. Flexibility is a major characteristic and therefore research can be modified as time shows up misconceptions etc.

3. Research is concerned with social processes and with meanings principally derived from symbolic interactionism i.e. studies are conducted with a view to understanding the way in which participants perceive situations.

4. Data collection and analysis occur simultaneously because of the inherent flexibility. Data is not collected to support/refute hypotheses but rather categories/concepts are developed and a theory emerges as the data is collected.

There were two major evaluation methodologies which particularly influenced the subsequent development of Interactionist Evaluation, Parlett and Hamilton's (1972) Illuminative Evaluation and Stake's (1976) Responsive Evaluation. Both are situated towards the qualitative end of Adelman and Alexander's continuum (see above) and both have characteristics which have been incorporated into Interactionist Evaluation. In the discussion of these evaluation methodologies, that follows in paragraphs 2.1 to 2.7, the aspects of these methodologies which have been incorporated into Interactionist Evaluation are discussed.

2.1 ILLUMINATIVE EVALUATION.

Illuminative Evaluation is an alternative evaluation methodology developed by Parlett & Hamilton (1972) in an attempt to counteract the weaknesses inherent in traditional evaluations. It uses skills more akin to the socio-anthropological investigator or the psychologist and historian than the traditional scientist.

During an evaluation it aims to study the course in some depth and using interpretive human insight, rather than the traditional measuring and prediction skills, and in doing so it attempts to describe the influences affecting success/failure and to therefore explain the data acquired through observation and participation.

"In short, it seeks to address and to illuminate a complex array of questions"

(Parlett & Hamilton 1972 p.10).

Illuminative Evaluation begins by accepting and observing that educational courses change and develop whilst they are in progress and that variations in interpretation exist with each new set of people and 'learning milieu' (that is interaction of cultural, social institutional and psychological variables), involved. It also acknowledges the importance of considering the learning milieu as an integral part of the course to be evaluated. Parlett & Hamilton (1972), believe that they cannot realistically be separated, because changes or modifications in one are intricately connected with developments in the other.

It also recognises the variations existing between different Illuminative Evaluations. In this way Illuminative Evaluation is an adaptable general research strategy, with the problems defining the methods and not as is the case with more traditional evaluations the other way round.

Illuminative Evaluation has three characteristic stages which are not distinct but overlap considerably.

observation **further inquiry** **explanation**

It is not specifically involved with decision-making but with explanations, and therefore the final reports describe and explain the phenomena observed. This should highlight or 'illuminate' the important features of a course and the differing bodies who receive the report can then make decisions based on the information relevant to them.

2.2 Techniques used in Illuminative Evaluation.

2.2.1.

Observation is an important technique in Illuminative Evaluation.
A continuous observational record is built up with useful comments which will help to clarify the observations.
Observation is one of the key techniques utilised in Interactionist Evaluation and its use within Interactionist Evaluation is described more fully in paragraph 4.2.1.
However Illuminative Evaluation also uses other techniques which Parlett and Hamilton (1972) feel should not be used in isolation.

These are:

2.2.2.

Interviews which aim to discover the views of participants and others not necessarily closely connected with the course. Usually interviewees are selected at random or by using 'theoretical sampling'. This is, Glaser and Strauss' (1976) technique of seeking out people who can give an insight into issues that have been observed and require further elucidation. This technique is described further in paragraph 3.2.1.

2.2.3.

Questionnaires which can help to sustain or qualify earlier tentative findings from discussion and observation. Such a technique is felt to be especially useful when evaluating large courses. However, Parlett and Hamilton (1972) stress that they should be carefully prepared and should not be used in isolation.
Questionnaires played an important role in Interactionist Evaluation in evaluating the quality of the course, but an increasingly minor role in evaluating the impact of the course. There were found to be useful in identifying issues and verifying data acquired through observation or discussion with a larger group of course members. Examples of the questionnaires used in the evaluations described in the case studies (see paragraphs 3.3 to 3.7) can be seen in Appendices 3 to 6.

2.2.4.

Written comments and check-lists on courses, whilst like questionnaires have the limitations of impersonal and intrusive techniques, can give greater insight into the participant's view of the course.

2.2.5.

Work diaries that record activities over a specific period of time are a very good way of looking at the data from the participants' viewpoint. The use of evaluation diaries is a development which occurred after the major part of this research and is described more fully in the Summary of this thesis (see paragraph 5).

2.3 Problems of Illuminative Evaluation.

These problems are shared in many instances by other qualitative evaluation methodologies and are ones that needed to be considered in the Interactionist Evaluation methodology. Consideration of the problems and the ways in which they can be overcome has therefore been of use in the development of Interactionist Evaluation.

2.3.1.

The subjective nature of Illuminative Evaluation is addressed by Parlett and Hamilton (1972) who ask "Can personal interpretation be scientific?".

No research study can be completely free from this label regardless of methods since all such studies involve people, who as Parlett and Hamilton (1972) say, make judgements and are thus vulnerable.

To counteract this criticism Parlett & Hamilton (1972) suggest that, at the report stage, critical research processes can be documented along with appropriate discussions of the findings, theoretical principles and methodological ground rules, and the criteria for selection and rejection made explicit. In this way all evidence is presented in such a way as to enable others to judge its worth.

2.3.2.

The participation in the course being evaluated will obviously affect the outcomes to some extent. Inevitably any collection of data initiates some effect, but this will be greater with greater participation on the part of the collector and will therefore be greater with 'illuminative' type evaluations than with more traditional type evaluations. The subsequent effect on the data collected must be considered alongside the additional and depth of data collected and the decision made as to the worth of such methods.

2.3.3.

Many of the techniques employed in Illuminative Evaluation are very time consuming and the danger is that the evaluation becomes larger and more important than the course.

2.4 RESPONSIVE EVALUATION.

Responsive Evaluation described by Stake (1976) is an alternative to more traditional or pre-ordinate evaluations, which take as their point of reference, objectives, criteria or methods set prior to the commencement of work and are concerned with establishing the extent to which a course's pre-specified objectives have been achieved. Unlike pre-ordinate evaluation, in Responsive Evaluation, the evaluator is not looking for specific pre-arranged phenomena; the evaluation being organised around the phenomena encountered. It anticipates idiosyncrasy, unpredictability and the uniqueness of the individual's experiences in educational settings.
Stake (1976)regards evaluation as a simple ratio. In course evaluation this ratio is

$$\frac{\text{values held for program}}{\text{complex of expectations \& criteria that different people have for program}}$$

The evaluator does not have the job of solving the equation but to make sense of the observations with reference to the satisfaction or dissatisfaction of those concerned, identified by Stake (1976) as the clients. He feels that there are many different, and no one right way of evaluating courses, although he personally prefers an evaluation to provide a service. Therefore it is necessary to know the interests and language of those you are serving and to spend time learning about the needs of the people for whom the evaluation is being done. The evaluator should have knowledge of whom he is working for and their concerns.

Stake (1976) believes that a responsive evaluation such as this has three characteristics.

1. It relates more directly to course activities than intents.

2. It responds to audience requirements for information.

3. The different values-perspectives of people concerned are referred to in the report of success and failure.

2.5 Techniques used in Responsive Evaluation.

2.5.1.
Issues of importance are identified by direct contact with those concerned with the course to be evaluated.

2.5.2.
Detailed documentation regarding the course is used to further identify important issues.

2.5.3.
Direct, personal observation of the course and its activities is undertaken prior to formal design of the evaluation. This is expected to increase the understanding of the important issues and assist in evaluation decision making.

2.5.4.
The evaluation design includes continuing, direct qualitative observations in the naturalistic setting of the course.

2.5.5.
The information from the evaluation is reported via direct personal contact through easy to understand themes.

2.5.6.
The evaluator plans observations and negotiations and arranges for others to observe the course and to verify his own observations (evaluate the evaluator). The course leaders are asked to react to the accuracy of data gathered and the audience's reactions to the findings are taken into consideration. Therefore all those concerned with the course are used to verify or refute the findings.

2.5.7
The information in the reports is matched to those different audiences who will receive it, that is, he finds out what is of value to those who receive his report. Stake (1976) feels that reports are not essential but depend on the individual course and its components.

Responsive Evaluation is therefore supposed to be of service and to emphasise the issues important for each particular course. It is based upon what people do naturally that is to observe and react. As Patton (1987) says, it is based upon learning first hand via face-to-face discussion about the issues that are of importance to those being studied.

Responsive Evaluation is thought by Stake (1976) to be useful during formative evaluation to monitor the course for any problems which arise, and during summative evaluation when an understanding of a course's strengths and weaknesses can be provided.

Stake (1976) believes that more traditional evaluation is not sensitive enough to monitor the variables affecting changes in a course.

2.6 Problems of Responsive Evaluation.

As with Illuminative Evaluation, some of these problems are ones that needed to be overcome in the Interactionist Evaluation methodology. Consideration of the problems and the ways in which they can be overcome has therefore been of use in the development of Interactionist evaluation.

2.6.1.

Although Responsive Evaluation needs planning and structure it relies little on formal statements, more importantly it relies upon the individual course and the people involved for the amount of structure needed. Therefore decisions as to what is appropriate in each situation have to be made by the evaluator and this element of subjectivity may cause problems.

2.6.2.

There is a danger that the Responsive Evaluation reports, which Stake (1975) feels should use portrayals including several media avenues, will be vague and unstructured. Unless the reports are in a format that can be easily referred to, it is possible that they will be of little use to those they are designed to serve.

2.6.3

As with other qualitative evaluations the participant nature of the responsive evaluator will have a much greater effect on the outcomes than more traditional evaluations. The effect of the interactionist evaluator is discussed within each of the case studies here (see paragraphs 3.3 to 3.7 and in paragraph 4.3.1)

2.7 Implications for Interactionist Evaluation.

Both Illuminative and Responsive Evaluations influenced my own understanding of course evaluation and the subsequent development of Interactionist Evaluation. I was particularly interested in an adaptable, qualitative research methodology which not only recognised and considered the problems that occurred during the evaluation but responded to them.

3. PART 2: THE CASE STUDIES.

3.1. INTRODUCTION.

As described in paragraph 1.1 the decision to use a case study format resulted from the evaluation changes made at the beginning of the second year of the courses (see footnote page 5). It is believed by Macdonald and Walker (1975), that some curriculum evaluators are using case studies to overcome the problems with traditional methodologies as outlined in Part 1. Case studies are involved with the issues and concerns that emerge from classroom and school practice (Walker 1985), and appear to be a way of portraying the experiences of those being evaluated and the learning milieu of courses involved. I have found the use of case studies to be particularly valuable because, as Yin (1984) has identified, case studies consider the context of phenomena and I have become increasingly aware of the effect of the context on the evaluation. In collecting and analysing data from the schools involved in the case studies described here, I was aware of many of the influencing factors which are represented in Figure 1 (see page 13), and attempted to consider how the data was affected by these factors.

3.2. THE CONTEXT OF THE CASE STUDIES.

The schools used in these studies all participated in the D.E.S. Primary Science Consultant's/Co-ordinator's Courses run at Trent Polytechnic (now The Nottingham Trent University) from March 1985 until March 1989. These courses were run in response to D.E.S. circulars 4/84, 5/85, 1/86 and 9/87 (see footnote page 5). Teacher selection for the courses was undertaken by the individual local authorities and the Polytechnic not only had no part in the procedure but until commencement of each course was provided only with a list of teachers' and schools' names.

The two local authorities featured in this study, selected their participants in differing ways. One authority invited teachers to attend, although the criteria for invitation were vague. The other requested applications from interested teachers and if applications outnumbered places then a selection procedure took place, the criteria for which were unknown to the Polytechnic.

One of the first tasks of the evaluation of each course was to discover the teachers' background, which included reasons for wanting to participate in the course and this was achieved via a questionnaire (see Appendix 3). Discussions with course members clarified and verified the findings of these questionnaires. Teachers initially

attended the course for a variety of complex reasons not all of which they will disclose via a questionnaire.

Almost all the teachers hoped that their own science expertise and ability to teach science would be improved and all hoped that they would develop management skills to enable them to improve science throughout their schools. Some were indeed relatively advanced in these areas whilst others required a great deal of assistance from the course leaders.

A large number of teachers attended the course because they saw it as a good stepping stone to further their careers while a few sought assistance to develop science amongst unwilling staff and with sceptical headteachers. It is, therefore, apparent that not all teachers began the courses with the full commitment of their headteachers and staff, despite this being acknowledged as essential for full participation on the course and despite reference having been made to this in the publicity for the course (see Appendix 2). Some headteachers have acknowledged that they agreed to their school being a part of such a course to appease the teacher concerned and did not expect much to be achieved by their attendance. For example during the 3/85 course one headteacher saw

"no benefit to .... as an individual and" was "very sceptical re. courses and their benefit",

(see 3/85 school visits notebook in research database)

whilst during the 1/86 course another headteacher indicated that he had no expectations of the course

"except the professional development of..... and the spin off effects of that on the school" (see 1/86 school visits notebook in research database).

3.2.1. Choosing course members for evaluation purposes.

Consequently at the beginning of each course it was necessary to ascertain the abilities, expectations and school situation of each teacher to enable the course to be geared to each particular group of teachers and their working situations.

Once this had been done a number of the course members (approximately one quarter of each course) were selected using theoretical sampling (Glaser & Strauss 1967). Theoretical sampling is a technique used by Glaser and Strauss (1967) to discover theory from data, that is a theory which develops from the data collected or is grounded in the data. Grounded theory is a process whereby data is collected, coded and analysed simultaneously and then the decision as to what data to collect next is made in

order to develop a theory as it emerges. The cyclic nature which characterised the development of the Interactionist methodology, and which is illustrated in Figure 2 (see page 16), utilises these ideas. Theories emerge from the data and subsequent sampling helps to develop them. During the Data Collection Phase (see paragraph 1.8) data is not collected to prove or disprove a preconceived hypothesis but theories will emerge from data already collected. Once a theory emerges, decisions are then made as to which data to collect next in order to focus further on the theory. For example in the evaluation described here, I collected data (see paragraph 1.3.1. and Research Audit in Appendix 10) which indicated that the courses lacked relevance to Infant teachers. I decided to monitor Infant teachers on subsequent courses to ascertain a) the validity of this theory and b) whether changes made by the course team made the course more relevant to Infant teachers. This was done by choosing Infant course members for evaluation visits and by asking on questionnaires (see Appendices 3 & 6) for respondents to identify the type of school in which they work. This decision to choose Infant course members to explore the theory that the course was not totally relevant to them is an example of Glaser and Strauss's (1967) theoretical sampling. Another example was that some course members acknowledged that the decision to attend the course was made because their feeder Infant or Junior school had taken part in a previous course. One such teacher stated via the initial evaluation questionnaire that she expected her school to benefit through liaision

"with the Junior school whose deputy headteacher attended last years course".

(see 3/85 school visits notebook)

It was then decided by the steering committee to look further at such pairs of schools and to consider the impact of the course on them.

During any course, teachers were chosen, as described above, to develop one or more emerging theory, but in addition some teachers or their headteachers requested to be part of the school focus of the evaluation. However, it is essential for the success of evaluation of this kind that full co-operation from course member, headteacher and staff are obtained and if these were not forthcoming then the evaluation could not proceed. As well as negotiating access and co-operation it was essential to discuss confidentiality at all stages in the evaluation. Brierley (1989) discovered in her similar small scale evaluation of science in-service courses the importance of safeguarding the anonymity of those involved. I was able to assure all participants that data would be handled in confidence but that I would be using some data as discussion points which allowed me to verify relevant data with them. In this way acquired data was discussed with multiple participants (Walker 1983) and only subsequently used if full negotiation and consent had occurred as to its accuracy and its release for further use. However, formal reports have not been shown to those involved and these case studies, which

have a different function to the original evaluation have not been made accessible, for I feel that to do this would be to breach the trust of those teachers concerned.

3.2.2. Evaluation procedure.

Evaluation of the quality of the course was carried out mainly within the Polytechnic as the courses were running. I attended once or twice during each phase of the course, sometimes at the beginning and always at the end of the phase, collecting data about the quality of the course by observing, participating, discussing and asking questions. During the first evaluation visit, I explained the purpose of the evaluation, stressing the purposes as being involved with course quality and impact and not being to evaluate the individual teacher's development. I also asked each teacher to fill in a questionnaire (see Appendix 3) to ascertain their scientific background, how science was taught within their school and their expectations of the course. Data from the questionnaires was used by the course team when modifying the course to suit the individual teachers involved. At the end of each phase, I asked each course member to complete another questionnaire (see Appendix 4) about the specific sessions undertaken and then I discussed the phase with all the participants present. These discussions and the questionnaires allowed me to evaluate the quality of the course, although some theories which emerged from the data would be further considered during the school visits. These school visits focused on the impact of the course within the school context. I observed the way in which science was taught and organised within the school, observed children and the work they were undertaking and discussed with the course member, headteacher and other staff the development of certain key areas (see footnote page 10) in science and the impact that the course had on that development. Details of the visits were described in a school visit notebook, which was filled in after the visit. Before undertaking the school visits I carefully considered the use of different methods of collecting data.

a) Audio-recording whilst being a convenient method of obtaining large quantities of data, excludes visual stimuli, non-verbal communication and involves a particular view of events, (Ball 1983). The analysis of tapes can be very time consuming and it is possible, as Powney and Watts (1987) discovered, that typed transcripts are not true representations of the discussions. The use of a tape recorder will probably restrict the quality of the information that the informant will give, preventing rambling and the new avenues for investigation that may be indicated. However Evans (1981), using tapes whilst evaluating in-service B.Ed. courses, found that they did naturally include items of significance to the interviewee.

b) Video recording also gives a particular view of events and may therefore exclude important data. Restriction of information is likely to occur for the same reasons as the use of audio equipment. It is also unmanageable in a small situation and unless an assistant is available will prevent the evaluator from other important observations and participations.

c) Ball (1983) feels that a field notebook "the translation of live social action, written description and commentary" is possibly the most sophisticated method to use in collection of data. Problems here are that in the translations from field reality to notebook reality to final report the data could be quite distorted. It may also be a problem if the evaluator uses a third party to write up the notes as certain issues may be missed or misread.

The field notebook method is fairly closely comparable with the data collection method utilised by Interactionist Evaluation in the case studies described in Part 2 of this thesis. My decision to use notebooks was made because I felt that to enter into discussions with schools armed with recording devices of any sort would detract from the quality of data. I would therefore, have some ideas, or theories on which I would attempt to collect data. These may be theories which have emerged from data already collected, for example, that the course had little relevance to Infant teachers (see case study 1 paragraph 3.3.4 and paragraph 1.3.1) or that national changes had affected attitudes towards school science development (see case study 5 paragraph 3.7.3). Alternatively, it may be data on the key areas of development (see footnote page 10) that is desired. After each visit, the data was put into the school visit notebook (see Appendix 8 for extracts from the school visits notebooks). Data within the notebook was collected into categories, data from one school being together and sub-categorised into areas of discussion or theories being explored. Extracts from these notebooks can be found in Appendices 8a and 8b. In Appendix 8a data on all visits to the school in case study 2 can be seen and in Appendix 8b data from one school visit to the school in case study 5 can be seen. The categories for data collection were decided before each school visit and whilst they focussed on the key areas of development (see footnote page 10), some were individual to schools. This data was not written down in the notebooks during the school visit but immediately after, whilst the data was 'fresh in my mind' . This ensured that data was not with-held or distorted because of the recording technique used. The amount of data and its validity could have been reduced as a result, but it was felt that this could to some extent be overcome by the use of triangulation.

I would therefore be involved in approximately ten visits to the Polytechnic whilst each course was running, one or two visits to groups of teachers involved in support group meetings within their local education authorities and, visiting up to eighteen schools from the four courses described in this thesis (see footnote page 5); two schools from the first course, six from the second, four from the third and six from the fourth. It must be remembered that the courses continued as twenty day courses after this time and additional schools from later courses were visited, but they do not form part of this thesis. Additionally, school visits were cumulative so that by the fourth year visits were being made to a maximum of eighteen schools. The five schools used as case studies within this thesis, were taken from the first eighteen schools involved in the evaluation and visits to them continued until the end of 1990. Details of these visits can be found in the Research Database which is described in Appendix 1 of the thesis and in the evaluation reports (Johnston 1986, 1987, 1988, 1989).
This thesis looks at five schools involved in the original evaluation and via the case studies of these schools discusses the effect of the evaluation methodology on them and how interaction with those concerned affected the evaluation methodology.

3.2.3. The courses.

As outlined earlier, the courses described in this thesis took place over a four year period from 1985 to 1989. During that time the educational climate changed considerably and especial changes were observed in science education as a result of its recognition by the National Curriculum (D.E.S. 1988 Education Reform Act; D.E.S. 1989) as having equal importance with Mathematics and English. The National Curriculum was in its consultative stage during the final two courses described here and this led to considerable modification to the course structure, as the course leaders attempted to reflect the changing nature of primary science. The effect of the National Curriculum was more pronounced within the schools for over half of the research period of 1985 to 1991. This is because all schools were responding to proposed and actual changes from 1988, when most of the school visits were taking place.

Internal factors over the four year period also led to changes in the structure of the course. These internal changes can be placed into three categories, the course team, the course membership and the course evaluation. The course team underwent considerable changes during the four year period being discussed, in particular it had three course leaders with differing expertise and perspectives. Course membership

too, underwent changes and these two factors combined to influence changes in the course evaluation. These changes are discussed below in more detail.

During the first year of the course the course leader was the major contributor to the course with a small input from other staff and outside visitors. The expertise of the team was one of mainly secondary science teaching but with recent experience in primary science provision at Higher Education level.

Course membership changed along with the educational climate. Initially the course membership was varied with teachers attending from six local education authorities and representing Infant, Junior and Middle schools. Inevitably these teachers attended the course with differing needs which reflected the type of school they taught in and the importance placed on science within that school as well as differing personal expertise in science. As science in the primary school was recognised as an important component of the curriculum, the knowledge and expectations of course members increased. The teachers were recruited from fewer local education authorities as other, more local, institutions began to offer similar courses and minority groups, such as Middle and Special school teachers were less represented.

At the outset the evaluator's role whilst influencing future planning was summative in that a report at the end of each course provided data on the quality of the course provision. This was achieved through questionnaires and formal course evaluation sessions. During the first year of the courses I noted the lack of match for some groups through the evaluations. This idea was first raised during a school visit, described in the 4/84 evaluation report, when a teacher identified that a major criticism of the course was

"that it had been difficult to find or adapt material for use with Nursery/Infant children. It was felt that it was not good enough to simply adapt material for use with this age group"

(Johnston 1986 page 13).

This area of concern was then discussed during an evaluation session with other course members from Infant schools who felt

" that the course could have had a great deal more content applicable to them"

(Johnston 1986 page 13).

and after discussion with the course leader and steering committee I began to follow up the initial evaluations into the quality of the courses, with a study of the long term impact of the course with particular reference to groups within the cohorts.

The end of the first year of the course saw a change in the course leader and subsequent change in the style of the course. This was characterised by a more flexible and responsive approach to the structure of the course which attempted to meet the needs of the course members but resulted in a perceived lack of direction on occasions. Although this style of leadership was characteristic of the course leader it was acknowledged that the flexibility was to some extent a response to my own evaluations and the perceived needs of the course members as illustrated in the evaluation reports (Johnston 1986; 1987; 1988; 1989). For example, during the second course, it was identified (Johnston 1987) that flexibility was needed because of the different needs and expertise of the course members, the group size and the different school situations (from Middle to Infant/Nursery school). Figure 1 (see page 13) illustrates these and other influencing factors. The extent to which individual factors affected the resulting course are difficult to ascertain because as Benson and Michael (1987) believe the interaction of the factors occur simultaneously. The course did attempt to respond to identified needs and the resulting flexibility enabled me to develop the evaluation characteristics (see paragraph 4.1) to a much greater extent than would have been possible otherwise. A final change in course leader retained the flexible quality which enabled the evaluation to continue along the lines already taken but ensured greater rigour in the course structure.

These changes had an effect on many different areas of the course. The changing course structure was a large factor in establishing a flexible evaluation approach as advocated by (Burgess 1985 and Porter 1984). The changes in course leadership affected the course team whose varying expertise were utilised to a much greater extent as subsequent courses progressed. Team membership also changed resulting in greater primary expertise being offered, though mainly Junior in nature.

Changes in the course membership were also observed during the four year period. The number of local education authorities represented declined until the original six became the two that this thesis includes. This reflected in part the changes in the educational climate already discussed, the increasing importance placed on science in the National Curriculum, the geographical locations of the authorities concerned and the style of course. The result of the changing emphasis on primary science education was that primary science courses were provided by many more higher education establishments and local education authorities.

These changes led to changes within the cohorts. These were mainly in the form of an increase in three areas, confidence in science education, expectations and assertiveness to change course structure to suit individual requirements. Both the

course members and course leaders increasingly recognised, as did Brierley (1989) the importance of time to consider and implement in-service decisions and this appeared to be reflected in the increased time available for school-based in-service and staff development. Teachers in both the local education authorities described in this thesis were able to benefit from changes in teacher support in the form of teacher in-service training days, non-contact time and local authority support teachers. During these courses my role as evaluator was modified, for as Walker (1985) has said it is often the evaluator who is most changed by the evaluation. These modifications were in line with both external and internal changes and in order to meet the changing needs of the teachers and the modified aims of the evaluation. At that time I was, as a practising primary teacher, working at Key Stages 1 and 2 and having to adapt my own practice to take into account impending national changes. I was therefore able to share the course members' concerns and relate them to the course team. This resulted in a change of emphasis during the years to a more flexible approach to course planning, involving me to a greater extent in suggesting modifications to the course structure as a result of my interactions with the course members.

3.2.4. Key areas of development.

These key areas were ones which the course aimed to influence (see footnote page 10). A questionnaire (see Appendix 5) during and at the end of each course asked for course members to indicate their development in these key areas. The full details of the data from such questionnaires can be found within the evaluation reports (Johnston 1986; 1987; 1988; 1989). The data collected then formed the basis for further discussion with the course members to ascertain how the course could be restructured to ensure continued development in these areas. There were some common trends in this data over the four year period, for example the areas of matching pupils' needs and abilities and assessment/monitoring were rated as the bottom two areas at the end of every year. Some of the data indicated changes in the course, course members and evaluation focus. One example of this is the development of a school science curriculum or policy. The first course emphasised the development of a school science policy, but the end of course questionnaire (see Appendix 5) indicated that teachers did not feel it to be an area of good improvement (Johnston 1986). School visits, at that time, revealed one teacher's concern about the development of this area.

> "It appeared that some course members felt that the task of implementing a science policy should be complete by the final week of the course instead of being in the initial stages"
>
> (Johnston 1986)

and this caused some anxiety.

The issue was discussed further with other course members during a local education authority support group meeting (Johnston 1987) when similar fears were expressed. Feedback to the steering committee led to a change of focus during the next year with good results, when the end of course questionnaire identified the development of a school science policy to be the best area of improvement (Johnston 1987). The data collected from this questionnaire can be seen in Appendix 5b. During the next two years the course was not felt to achieve development in this area to any great extent (Johnston 1988 & 1989). This was possibly as a result of two factors. Individual course members needs and abilities, as identified by the initial course questionnaire, had changed considerably since science had become an established part of the primary curriculum. Additionally the course was to a large extent overtaken by national events in the form of discussions and consultative documents about the nature of science in the National Curriculum. These factors resulted in an uncertain climate in which schools recognised the importance of a coherent policy in science but were unsure of the future, legal demands that would be made on them and so they were unable to make improvements in their science provision.

3.2.5 The Evaluator.

As the courses progressed the results of these internal and external changes on the evaluator's role became pronounced. From being an outside evaluator looking at the quality of the course provision, I became part of the course team, not involved with the teaching, but perceived by the course members as a channel for their concerns on course quality, an additional source of advice and a participant in the struggle that many course members had to achieve sustained developments in the school context. This is similar in part to Bell's (1990) idea of an outsider consultant in a collaborative evaluation.

The importance of my parallel role as a fellow teacher is also stressed, although I do not consider that a dual role is always necessary. However there are other factors, qualities and skills which can affect the performance of an evaluator. Such influencing factors include the personalities involved (course leader, course team, course members and my own) and these in turn had an effect on the teaching styles of the courses (Measor 1985, Denscombe 1983, and Hitchcock 1983). An open mind is an essential quality for an evaluator and useful skills include good questioning and listening skills, flexibility of approach, ability to grasp issues and display a lack of bias (Yin 1984) .

It is also important for an evaluator to consider the factors, qualities and skills which are appropriate before the commencement of the evaluation as these influence the role of the evaluator and the nature of the evaluation (see paragraph 4.3).

The idea of the evaluator as being part of the course team does require careful monitoring and changes of evaluators are necessary at regular intervals to ensure that an almost 'cosy' evaluation situation does not occur. During 1990, I decided that through my role as evaluator I had become too involved in the courses and that a new evaluator was desirable.

3.2.6. Case Study Introduction.

Before looking at the case studies themselves it is important to stress that case studies are concerned with "the study of an instance in action," (Macdonald & Walker 1975 and Adelman, Jenkins & Kemmis 1976). These case studies identify an instance in the life of a school and although the variables affecting the on-going social process which is the essence of every school, have been taken into consideration, such case studies only tell 'a' truth (Walker 1983) and will not accurately represent some aspects of that social process.

The purpose of the following case studies is to describe the context in which the evaluation methodology developed and to illustrate how it was influenced by the needs of the course evaluation. The case studies are used within this thesis to emphasise issues that arose from the evaluation and to show how they influenced the development of the methodology.

The effectiveness of the methodology on the key areas of primary science development, as identified in the original evaluations is also described in each case study. Data about the effectiveness of the key areas has also been collated into Tables 1 and 2 so that the effectiveness of the methodology on the key areas can be closely examined. Therefore each case study represents an instance in the development of the final research methodology and as a whole make up the major influences acting upon the evaluation design.

Example data from each case study can be viewed in Appendices 3 to 9 which include full extracts from the research database (see Appendix1) in the form of completed questionnaires (Appendices 3b, 5b and 6b), discussion documents used in school (Appendix 7), data from the school visits notebooks (Appendices 8a and 8b) and planning documents (Appendix 9). The evaluation and data processing techniques used are considered further in Appendix 10, The research audit, where examples of the use of each technique are given.

3.3. CASE STUDY 1.

The school was important from an evaluation point of view because the evaluation role was influenced by my interaction with it. At the beginning of the interaction I perceived my role to be objective and to be concerned with summatively evaluating the effect of the course on the school. I anticipated that this could be done by ascertaining to what extent pre-requisite objectives (Adelman and Alexander 1982), in the form of the key areas of development (see footnote page 10) had been achieved. During the interaction, I became aware of Stecher and Davis' (1987) idea that evaluations could be tailored to meet the needs of those individuals who are involved in them. The case study therefore describes the interactions which occurred and the effect of those interactions on the key areas of development as well as the evaluation methodology.

3.3.1. The school

This school was involved with the first course at Trent Polytechnic (now The Nottingham Trent University), D.E.S. 4/84 (see footnote page 5), and school visits occurred between 1985 and 1989. A previous evaluation of a similar but shorter course (Nottingham University 1983) had indicated that relevance to Infant/First school colleagues was not well achieved. Despite the fact that Infant teachers were in the minority on the course at that time, the steering committee decided that the initial school visits should focus on teachers of both Infant and Junior children. It was at this early stage in the evaluation that it was collectively decided to deliberately choose schools for certain characteristics, a technique termed theoretical sampling by Glaser and Strauss (1967). This technique is described fully in paragraph 3.2.1.

The school is a large modern-built Infant school situated in an open, grassy complex with a separate Junior school and lying on the outskirts of a large Nottinghamshire town. The children attending the school are mainly from white middle and working class families. The course member teaching at this school was, at the beginning of the course, a young teacher in her twenties with a post of responsibility for science. She appeared to be enthusiastic about acquiring new skills but was apprehensive about her academic standard in science. It was therefore important to build up a relationship with her, as Hitchcock (1983) has said, based on mutual trust. In such a situation if a successful relationship can be developed then important information is less likely to be withheld.

3.3.2. Science in the school prior to involvement on the course.

Data about the school was collected from the initial course questionnaire (see Appendix 3) and later discussed with the course member and the headteacher during school visits (see 4/84 school notes and 4/84 evaluation report Johnston 1986). It was identified by the course member that the staff had no formal science qualifications and little enthusiasm for science. Such a lack of interest in science on the part of the teachers is thought (Ormerod and Duckworth 1975 & Harlen 1977) to have an influence on children's future interests and although these attitudes may be changed later on in the children's education they may also be reinforced. The course member had some knowledge and considerable interest but no background in science.

There were no staff resource books available and very little equipment. Resources that were available tended to be of the type found in all Infant schools which can be easily adapted or used for science investigations, for example sand and water trays. Any further resources were acquired as and when they were needed. Science was taught as a part of topic work, in groups or individually, as it arose, on an ad hoc basis. There was no science policy in the school and no planning of science and therefore no continuity and progression. These factors, combined with the staff's lack of enthusiasm and the inadequate resources meant that little science actually took place.

Within the course member's class, science was planned as part of the topic being covered. It tended to be environmental or biological in nature and there was little investigative work. The children worked either as a class, within groups or individually, depending on the type of work being undertaken.

The headteacher was an elderly lady who was not convinced of the need or importance of science in the school and therefore did not actively encourage her staff to include science in the curriculum. At this time, primary science was not an area of the curriculum given a high profile within schools (D.E.S. 1985) and despite the efforts of national projects for example Nuffield Foundation Junior Science Project (1964-6) and the Schools Council Science 5/13 Project (1967-74) and several local initiatives, science development in Nottinghamshire was spasmodic. Gilbert and Matthews (1981) stress the role of the headteacher in leading staff to develop a science policy, acquire appropriate resources and initiate staff development. Initial questionnaires (see Appendix 3) indicated that the headteacher had agreed to a member of her staff being part of the D.E.S. course because of that member of staff's enthusiasm rather

than her own commitment and discussion with the course member and headteacher clarified this further (see 4/84 school visits notebook). The headteacher felt that the main area of improvement would be the course members own expertise and confidence, thus improving her teaching (see 4/84 school visit notes).
The course member felt that by increasing her competence and confidence she would be able to advise her colleagues and improve the scientific education that the children received. I felt this would be a difficult task without the full support of her headteacher.

3.3.3 Science in the school at the end of the course.

I visited the school at the end of its year long involvement with the course. The staff had remained stable during that time. The school visits notes made during that visit indicate that both the headteacher and the course member felt that the school had benefited from their involvement in the course (see 4/84 school visits notebook).

The headteacher felt that the main benefit was one of expertise, with the course member now being available to act as a consultant to the staff. The course member agreed that she had benefited from the course by an increase in confidence and expertise, first on her part and increasingly on the part of the staff and children. Despite her initial lack of commitment to science development, the headteacher had supported the course member by providing time for discussion about science at staff meetings and for the course member to go into other classes and take lessons, assist and advise. This meant that all the staff were now aware of science development within the school, of recent developments in science education and were beginning to take full advantage of them It was felt that part of the staff's apparent change of heart regarding science was because they were

"beginning to see the enthusiasm with which science areas are received by children".

(4/84 school visit notes in research database).

Positive children's attitudes are thought (Harlen 1977) to greatly assist scientific development. In this case the staff felt it to have helped to promote the development of science education within the whole school by encouraging their staff development. It was hoped that this was the start of an on-going process of science development within the school.

The school still had not developed a working policy for science and there was still little evidence of planning and of progression. It was felt by the course member that this

would develop once the staff's confidence and competence in teaching science was increased, the importance of science was fully realised and its successful integration into topic work was achieved, but her perception was that she was being pressurised into developing at a faster speed.

3.3.4 The effect of the Interactionist Evaluator.

During this, the first year of the 4/84 type courses my role as evaluator was perceived as being very low key and not being involved in the functioning of the course whilst it was actually running. This perceived traditional role is characterised by detachment and is concerned with establishing the extent to which pre-specified objectives have been achieved (Adelman & Alexander 1982). However I realised from the onset of the course that this was unrealistic and the role was constantly revised during this year as a result of discussions with the course leaders and the course members. Discussions with the course member took place to ascertain how the course could be improved and I noted her comments on the course. This is an example of Stecher and Davis (1987) decision-focused approach.

As described earlier she was concerned

"that it was expected that the task of creating and implementing a school policy'" should be

"completed and not just beginning"

by the last week of the course and as a result she viewed the final week

"with trepidation".

(see 4/84 school visit notes in research database).

The idea that course members felt under pressure to develop science within their school had already been raised during a meeting of course members from another local education authority and, I noted in the evaluation report that

"the general feeling ...appeared to be one of despondency because of the apparent lack of progress". (Johnston 1986)

At that stage in the evaluation I did not see my role as including reassurance, but the importance of establishing a relationship with the people concerned (Measor 1985 & Denscombe 1983) was realised. This factor combined with my own opinion that it would have been unkind and unhelpful not to give assistance when asked, prompted the decision to discuss this issue at the time and to reassure the course member that other schools visited were not significantly more advanced than her school. I reported my dilemma to the course leaders and subsequently discussed the issues

involved at Steering Committee meetings with course leaders and representatives of the Local Education Authorities concerned.
Subsequently, on later courses the nature of the evaluation role was made much more explicit

"its very nature involves me in the course and with course leaders and course members and therefore the type of evaluation is qualitative rather than quantitative. "

(Johnston 1988 page 32)

The feedback of problems that emerged as a result of my evaluations had two effects on the courses. Firstly, problems such as perceived pressure were able to be identified at an early stage in the course and could if necessary be discussed with the headteachers. This involved me in a more formative type of evaluation. Secondly my role changed so that any further pressure on course members could be dealt with as and when it arose, usually by a school visit during which the subject could be brought up in discussion with the headteacher and/or staff.

Another issue that emerged during the evaluation concerned the need for continued support. The course member suggested that it would be beneficial to the whole cohort if some support group could be set up so that they could discuss problems. It was ideally felt that a system of in-service days, newsletters etc., would be the best way of beginning such support. Although one group of teachers had met informally to support each other, this issue was not adequately tackled within both local education authorities. Indeed although it has been accepted (D.E.S. 1992) that such support would be desirable, the constraints of time and funding always meant that it was shelved and it was six years after this issue was first identified that L.E. A. support staff were able to begin to become actively involved in supporting teachers on similar 20 day science courses, albeit for a short period, before financial considerations prohibited it.

The main criticism of the course was one of lack of relevance to the Infant and Nursery children. As identified earlier in this case study, this school was chosen to ascertain the impact of the course in the Infant school. The course member felt that

" it is not enough to adapt or expect the teachers to adapt material for use with younger children"

(4/84 school visit notes in research database).

As described in paragraph 1.3.1 I discussed this ideas with all course members during an evaluation visit to the course and it was additionally stressed by another course member during a school visit

"We must start young"

(see 4/84 school visit notes in research database)

This course member was chosen for evaluation purposes because he was teaching at the Junior level. However, he was responsible for science throughout the primary school and was finding that there was still

"a need for development especially amongst Infants" which "was not helped by very established cynical Infant staff".

(see 4/84 school visit notes in research database)

The interaction and the subsequent feedback to the course leaders led to greater planning involving course members with Infant experience and a greater part of the course content being Infant biased. The end of course evaluation questionnaires (see Appendices 5 & 6) identified a larger number of satisfied Infant teachers on subsequent courses.

Comments such as "I feel more confident" (Johnston 1988 page 29) and "helped me to develop a much more investigative approach" (Johnston 1989 page 27) were evidence for the success of this change. However the amount of input for Infant teachers continued to remain a criticism of the course not because the efforts made in this direction were inadequate but mainly because of the changing demands of teachers as science became an important part of the primary curriculum and because there was confusion over what Infant science entailed.

My changing role, as evaluator, to one of greater interaction was to a large extent the result of the visits and involvement with this particular school. Therefore by the end of the year there was beginning to emerge a new type of evaluation characterised by less detachment and greater involvement on the part of the evaluator with the course members and schools involved. This was the beginning of the model of evaluation that I have termed Interactionist Evaluation (see Part 3).

3.3.5 Science in the school two years later.

At this time my role had changed considerably to that of the dual formative/summative evaluator (see Figure 1 page 13). There had been considerable changes within the staff during the years between visits. The headteacher had retired and the previous

deputy headteacher had been promoted to headteacher. My observations verified by discussions with staff indicated that this new headteacher had leadership qualities and had used these to develop the staff's professional strengths and to improve their weaknesses. For example staff changes had led to

"a shift around of responsibilities"

and science was an area that

"was well tackled now"

(see 4/84 school visit notebook in research database).

The teacher who had attended the course had been promoted to deputy headteacher and was no longer directly responsible for science within the school. There was one newly qualified teacher and two temporary teachers due to maternity leave.

The school had just completed four terms of a Primary Science and Technology Project and this had assisted them in terms of finance and cover to enable the course member/deputy head to

"1. Plan science in other classes.
2. Show how science can be tackled.
3. Support and assist in the planning and implementation of science"

(see 4/84 school visit notes in research database).

3.3.6 Key areas of development.

I believe that my interaction with this school resulted in the enhancement of two key areas (see footnote page 10 and Tables 1 & 2 pages 90 and 91), that of the policy/school science curriculum and staff development (see 4/84 school visits notebook).

At the time of my final visit each teacher at this school was expected to prepare a separate forecast for the science to be covered each half term. There did not appear to be any overall planning to ensure continuity and progression.
The course had initiated ideas on the formation of a policy, but often by the end of the year its formation had only just begun. Additionally this course was prior to the National Curriculum with the resulting emphasis which was placed on school planning. By the end of this course the school had not embarked on the development of a policy and whilst my impact on this key area was very limited because of the constraints of the perceived role my influence appears to have readjusted the course members' expectations making them more realistic. However this case study illustrates my

realisation that increased involvement in the discussions can be of value and of the importance of relationships in acquiring useful data.

In the area of staff development the school was regarded as having been most successful. Staff development is perhaps the keystone for all other development. Without successful staff development and staff support scientific development of any kind is unlikely to be sustained (D.E.S. 1985).
Despite staff changes the school had continued via outside help and through their own means to develop their awareness and expertise in primary science. It was the first area to be addressed by the school and I was able to lend an ear to the problems and give some advice during the visits to the school. Basically the input was one of reassurance that the approaches made at that time were likely to be successful and that successful staff development was often slow and difficult.

3.3.7 Summary.

Whilst I was interacting with this particular school I was influenced by my perception of the role of an evaluator. My involvement was very limited and not fully interactive. As a result of this and other interactions during the initial year, the role of the evaluator became more formative. I was involved in observing the course whilst it was running, as well as providing summative feedback on the impact that the course was having within the schools concerned. From the onset of the D.E.S. courses I felt that detachment during evaluation was difficult. Discussions with course members highlighted the difficult side of the evaluator's role. This role I perceived did not encompass giving advice when asked or pointing out difficulties if they had not been envisaged or reassuring teachers when despondency had set in. As a classroom teacher at that time, and having worked through many of the same problems, it was equally difficult for me not to share experiences. Since the successful development of science education was the main concern, I considered it to be unreasonable not to give assistance when possible or to give guidance as to who best to turn to with a given problem.
Despite my changing ideas on and concerns about the role of the evaluator, I was involved in little direct interaction at this time. However, behind the scenes I questioned my role and attempted to make changes to the course structure as a result of the formative evaluations. Subsequent negotiations with the course leaders and steering committee led to the decision to evaluate the long term impact of the courses as

well as their quality. This resulted in changes to my role and to the course structure to provide more relevance for Infant colleagues.

3.4. CASE STUDY 2.

The school in this case study is interesting in that involvement with it played a large part in the formulation of my ideas concerning the influence of the evaluator on others involved in the evaluation. I had become aware of, and concerned about the multiple influence of factors that affected the evaluation (see Figure 1 page 13). My involvement with this school developed my ideas on the importance of how relationships may affect evaluation data and progress within the school context and I became particularly concerned with the influence of different relationships and subsequent interaction between individuals. I felt that relationships could affect both the data collected during the evaluation and the development of identified key areas (see footnote page 10). Complete data collected from this case study can be found in Appendix 8a.

3.4.1 The School.

The school in this case study was involved in the third course run at Trent Polytechnic (now The Nottingham Trent University), which was the 1/86 Primary Science Consultants Course (see footnote page 5) and was visited from 1987 to 1990. Data collected through evaluation questionnaires and on those visits, which were written into the 1/86 school visits notebook, can be seen in Appendix 8a. It was an interesting school from an evaluation viewpoint because it was the Junior school to which the children in case study 1 progressed and it was for this reason that the school was originally chosen. Its selection was an example of Glaser and Strauss' (1967) 'theoretical sampling' (see paragraph 3.2.1). Involving the school in the evaluation provided me with data from two schools but involving the same children. The school is modern, sharing an open plan grassy site with the Infant school, although detached and separate from it in terms of position and administration. When first visited there were nine classes, two in each year band and one mixed first and second year Junior class (Y3 and Y4) who occupied a portable classroom in the grounds. Obviously the children attending the school were from the same middle and working class families as in case study 1.

The course member indicated in the initial evaluation discussion that the school had been very impressed with the Infant school's development in science and that this had been an important factor in their decision to attend the course. This was confirmed by the headteacher and staff of the school during my first school visit when I wrote in my school visit notebook that the headteacher felt

"the Junior school falls down in providing further development"

(see Appendix 8a and 1/86 school visit notebook in research data base)

They had therefore decided that in order to achieve the continuity and progression which is widely recognised as desirable (D.E.S. 1985 & 1989, A.S.E. 1989) they would seek acceptance on a later D.E.S. course.

The course member who was a middle aged female teacher with no formal science background expressed at the start of the course her apprehension about science education and her ability to teach it (see Appendix 8a and completed questionnaire 1 in research data base). Teachers' beliefs about their competency are thought to effect their pupils' self concepts (Purkey 1970) and this could obviously have an unwelcome effect on any planned development.

3.4.2 Science in the school prior to involvement on the course.

In the initial evaluation questionnaire (see Appendix 3a) the course member indicated the staff were

" keen to attempt science but (were) not very confident in areas other than mathematical or natural science"

(see Appendix 8a and completed questionnaire 1 in research data base)

A poor background and inadequate initial training in sciences have been felt (Kerr & Engel 1980 and Plimmer 1981) to be a major factor in the lack of impact of national primary science initiatives such as the Nuffield Foundation Junior Science Project (1964-6) and the Schools Council Science 5/13 Project (1967-74). Evidence from recent surveys of schools (D.E.S. 1989b) indicates that in recent years many primary schools have begun to improve the quality of their science teaching. The introduction of Foundation subjects into the primary curriculum as part of the National Curriculum developments, may actually have slowed this down. However continued initiatives such as the L.E.A.T.G.S./G.E.S.T (D.E.S. 1989a) funded in-service courses attempt to address the problem of poor science expertise, especially in the physical sciences.

The school was resourced with Science Horizons (1981-86) and all that was necessary to teach it, as well as the Science 5/13 (Schools Council 1967-74) resource books. These however were little used as science was admitted to be a weak area of the curriculum, being taught as "one-offs" or as part of mathematics and topic work. (see Appendix 8a and completed evaluation questionnaire 1 in research data base). There was however some attempt at continuity and progression since each year group followed different topics, with the science taught depending on the topic. This

attempt at progression had not been followed through and no efforts had been made to check the area covered to see if there were any gaps or overlaps. Despite its acceptance as a weak area of the curriculum the staff valued science and recognised its importance

"We are all aware of the importance of teaching all the necessary skills and concepts but again feel a certain lack of confidence"

(see Appendix 8a and completed evaluation questionnaire 1 in research database).

During the course and school visits the course members expressed a growing concern about the headteacher's commitment to science in the school which led to her finding little time to complete aspects of the course. At the time of the second school visit I wrote in the school visit notebook that the course member was

"pessimistic re HT commitment"

and that she had

"not been able to use two and a half days of her cover because of lack of HT support."

(see Appendix 8a and 1/86 school visit notebook in research database)

My prior discussions with the course member had indicated that the headteacher, whilst recognising and accepting that science was generally felt to be an important part of the curriculum, was less than committed to it in real terms. Kerr and Engel (1980) have identified the failure of headteachers to recognise the potential contribution that science can make to the curriculum as a factor that may impede primary science development. Interactions with the school and staff identified him as being very apprehensive about science. Henerson, Morris and Fitz-gibbon (1987) believe that complex attitudes will be formed for a variety of equally complex reasons and have a number of manifestations. In his discussions with me the headteacher was apparently not at ease and I assumed that this was because of his lack of knowledge concerning the subject under discussion and possibly also because he was aware of his own lack of commitment to science development. He was obviously uncomfortable with the Infant school's success in science and hoped that the course would increase his staff's confidence to teach science and provide an input to develop a workable science policy. The initial step was to be a discussion document which he wanted to present to his staff during the school's involvement on the D.E.S. course and which he felt should include ideas on how to develop science throughout the whole school. Considering his apparent lack of commitment to the task being undertaken I doubted the outcome would be of any great importance or duration, because as Craig and Fisher (1988) have said headteachers have a

"crucial role to play in developing primary science in a school and there is unlikely to be a coherent policy without their active involvement" (page 16).

Despite her concerns the course member hoped that the course would

"increase my own knowledge which will then allow me to support and help colleagues in implementing a science policy and integrating this throughout the curriculum"

(see Appendix 8a and completed evaluation questionnaire 1 in research database).

3.4.3 Science in the school at the end of the course.

During the course the course member sought advice on how to deal with problems arising within her school as well as expressing her concern as to her headteacher's commitment (see above, Appendix 8a and 1/86 school visits notebook in research database). She felt that he wanted science to be taught well within the school but did not want to provide any resources or support for it and whilst she had been able to improve her own practice she

"knew little about what went on within other classes apart from the parallel class with whom she worked "

(see Appendix 8a and 1/86 school visits notebook in research database).

She was not a particularly confident lady and she felt that without her headteacher's support she would not be able to make the necessary changes within the school. I discussed the situation with the course leader and we decided that a school visit would positively focus on the support needed to initiate and sustain change. This was an example of interaction with those involved in the evaluation and one which I later called negative interaction (see paragraph.4.1.6) since as a result of the interaction the headteacher was to be encouraged to change his attitude towards science.

A visit to the school was arranged a few months after the end of the course.

Details of this visit are written up in the school visits notebook at that time (see Appendix 8a and 1/86 school visits notebook in research database). On arriving at the school I was met in the car park by the headteacher who was obviously flustered and informed me that the course member was absent from school and he had not been able to contact me. He was very reluctant to have any discussion with me concerning science in the school. I was then asked to wait in the car park whilst he went to get his diary to rearrange the visit. The following week another visit was made and again the headteacher was found to be very reluctant to discuss science. Eventually after discussion with the course member I was able to locate him in a corridor from which escape was impossible! From the resulting discussion I was able to ascertain that he felt that the school had benefited from the course because all the staff were interested in

science and the science being tackled was of an improved standard. A school policy had been devised and it was due to be implemented three months after the visit at the beginning of the next academic year.

Discussions with the course member indicated a slightly different picture. The course member felt very confident on a personal level as a result of the course. She felt that her science expertise had greatly improved and she had an on-going programme of topic based science which was working well. The children within her class appeared knowledgeable about science and were confident with a variety of approaches including problem solving. Within the rest of the school it was harder to assess the progress. As the course member had indicated previously, each class appeared to be an isolated unit, and she knew little about what science went on. There were as the Schools Council (1983) found in many primary schools, no successful strategies provided for ensuring that the school had a progressive programme of work. The course member had found that there was little time provided to look at and assess science and the headteacher's attitude had meant that she had not been able to utilise all the days provided by the course for work within school. The value of these days has been recognised by H.M.I. in their Report on designated courses (D.E.S. 1992). She had arranged and run an in-service day on science which was led by one of the local education authority's science advisers. This had enthused most staff but there was little follow-up work in evidence. The course member felt that the headteacher's commitment was not great but that he

"wanted to be seen to be doing the right thing".

(see Appendix 8a and 1/86 school visits notebook in research database).

His reluctance to discuss the progress of science was felt by the course member to be due to his lack of knowledge and his embarrassment at not supporting her and the course more. It was this embarrassment which she felt had prompted him to inform her the morning of my visit that she could have £700 to spend on science resources. She felt that this would greatly assist the implementation of her policy but it would be further assisted by release time to visit other classes and help them to develop science, especially since the policy had been developed without staff involvement or consultation.

3.4.4 The effect of the Interactionist Evaluator.

By this stage the 4/84 type courses (see footnote page 5) were in their third year and the role of the Interactionist Evaluator had become well defined (see Johnston 1988 page 32 and 3.3.4) and it was felt to be appropriate for me as evaluator to initiate interaction that would change the course of events. It was a collective decision by the course

leaders, course member and myself that evaluation visits to the school would stress the need for active co-operation on the part of all staff involved, in order to realise the considerable input of time, effort and finance that were needed to achieve successful scientific development. I encouraged the headteacher to visit the course during my school visits and these informal suggestions were followed up by invitations from the course leaders. These visits took the form of participation in the course followed by discussions with other headteachers, representatives of the steering committee which included members of the local education authorities, and course leaders, concerning relevant issues, such as the successful development and implementation of science within the schools.

The effect that I had as the evaluator during the visits to this school was quite startling. The headteacher was extremely apprehensive about discussing science and it was difficult to establish a working relationship with him. This view was shared by the course member who indicated that this apprehension existed for any subjects/discussions that the headteacher found "difficult" (see Appendix 8a and 1/86 school visits notebook in research database). Co-operation is essential in order to successfully build up a relationship (Denscombe 1983), and it was apparent that a good relationship would be extremely difficult with this particular headteacher. I then made the decision to attempt to use the headteacher's apprehension to the advantage of the course member and the development of science within the school. He appeared to respond well to gentle pressure, for example during the first school visit he

"agreed to provide some extra release time"

(see Appendix 8a and 1/86 school visits notebook in research database)

to enable the course member to help colleagues. He also accepted all the invitations to visit the course and the course member felt that these visits made him aware of the commitment of other headteachers to science education although he did not appear to actively respond until the next time that he felt pressurised, by for example an evaluation visit to his school. The pressure he perceived himself to be under was made apparent by his response to my impending visit by allocating a substantial amount of money for science resources. I wrote in the schools visits notebook at the time

"H.T. as a result of visit had given ..... £700 to purchase more resources for science!!?"

(see Appendix 8a and 1/86 school visits notebook in research database)

As with Porter's (1984) research, the course of events was being altered but Interactionist Evaluation (as defined in this study in paragraphs 4.1 to 4.2) recognises that such alterations occur with any evaluation and should therefore not only be accepted but utilised to achieve certain desired aims, agreed by most of the 'clients' of

the evaluation and in keeping with the aims of the course. This interaction was fundamental in developing my ideas regarding interaction and the role of the evaluator. These ideas have been translated into the methodology of Interactionist Evaluation described in paragraphs 4.1 and 4.2. In this case the staff, course member and the progress of science development within the school benefited from my interaction, and ultimately the headteacher would, even though, at the time, the interaction itself was not desirable to him.

3.4.5 Science in the school two years later.

Changes during the two years since the school's involvement on the course included the absence of the headteacher on a one year secondment. During his absence the deputy headteacher had replaced him and had subsequently been appointed to a headship. At the time of the third visit the headteacher had been back in school for two terms and a member of the peripatetic staff had replaced the deputy until the new deputy took up her appointment at the beginning the the next term. The new deputy had some expertise in science and it was expected that she would add new dimensions to the school's science work. The majority of the rest of the staff had remained with one new addition replacing the teacher who at the last visit was due to leave.

The most impressive change in the two years was in the attitude of the headteacher, who appeared relaxed, and friendly. The course member indicated that he had

"mellowed"

and that

"this had resulted from his secondment"

(see Appendix 8a and 1/86 school visit notebook in research database)

I spent an hour discussing the school and its development in science, during which time he was open and frank. This was followed by a tour of the school which allowed me more opportunities to talk to children, observe science work being undertaken in the classes and to discuss issues with teachers than I had been allowed on previous visits.

3.4.6 Key areas of Development.

This school had over the years since its involvement with the D.E.S. course made significant progress in a number of areas. Discussions with those concerned led me to believe that my interaction with the school influenced progress in five of the key areas of development (see footnote page 10 and Table 2 page 91). A school science

policy had been developed during the course and despite the fact that it had not involved staff discussions, a feature felt by many to assist successful development (Gilbert & Matthews 1984, Craig & Fisher 1988, Sherring 1989), it had remained in operation and had needed only slight amendments in light of the National Curriculum. It was a very usable and workable document including sections on the following areas:

Introduction
Aims and Objectives of Science in the School.
Skills and Attitudes List.
Subject Headings (adapted to conform to the 1989 National Curriculum for example, The Earth in Space, Light).
Examples of activities that can be included in work on the suggested subjects with reference to workcards and resources in school.

A two year cycle had been retained and all the subject areas would be covered during Years One and Two of the Junior School (Y3 & 4) and then repeated during Years Three and Four (Y5 & 6) using different topics and at differing levels.

During previous evaluation visits the policy had been discussed and had featured highly on the course member's and headteacher's priority list. I felt that without full staff support and consultation the policy would be unworkable and would prove therefore to be a wasted effort. However, since the course member was lacking in confidence, non-substantive interaction (see paragraph 4.1.6) on this issue appeared to be desirable at that point in time. In the course of this evaluation I felt that suitable interaction should aim to increase the headteacher's, and subsequently the staff's, awareness of science and its important place in the curriculum and to initiate satisfactory discussion with the headteacher and the course member so that science could be developed further. I had grave doubts as to whether this could be achieved and the implementation of a science policy subsequently be tackled. I was therefore extremely surprised and pleased to see that the original science policy had been successfully utilised.

Another area of influence is concerned with the organisation of practical investigations. During the first two visits to the school there had been limited opportunities to see other members of staff and the science work that they were undertaking. The third visit involved a tour of the school and opportunities to see work and talk not only to staff but to children. There was evidence of a considerable amount of science work at all levels and in all classes which included technology and problem solving activities.

The headteacher and course member felt that the

"staff have adapted well to ideas"

(see Appendix 8a and 1/86 school visits notebook in research database)

and that the initial innovation in science was being successfully continued.

The course member felt that initially, changes in the way in which science was organised in the school and in individual classes was due to the absence of the headteacher. During his absence there were opportunities to present the finished science policy and begin to use it within the school. The policy's implementation began at the beginning of the 1988-1989 academic year. The publication of the National Curriculum (D.E.S. 1989) had focused attention further on science and its integration within the curriculum and its contents were felt to have supported the school's policy. All teaching in the school had been organised around themes, each one taking half a term and being roughly designed to encompass one area of science (or Attainment Target from the 1989 National Curriculum in Science). The staff had begun to realise that a theme will often involve more than one Attainment Target and the head believed that some mini-topics would help to cover aspects of the National Curriculum not easily covered in themes.

The staff had made considerable improvements in the way that they organised science within their classroom, using a

"thematic approach".

(see Appendix 8a and 1/86 school visits notebook in research database)

This approach was fundamental to the policy document written as a result of the school's involvement with the course.

The major reason for the staff's improvements in this area was felt to be the increase in their confidence about teaching science which initially

"enabled ..... to develop a policy document".

(see Appendix 8a and 1/86 school visits notebook in research database)

The part played by myself and the D.E.S. course was in the increase in confidence and expertise of the course member. This increase was in part due to specific sessions on organisational issues, including a visit to the Rolleston Teacher's Centre in Leicestershire during which copies of their primary science document were distributed (see Craig & Fisher 1988). Another contributory factor was the absence of the headteacher during which time the course member felt relatively unconstrained and was able to assist the staff. I wrote in the school visits notebook at that time that

"the best assistance to the staff has been 'time' to get out of the class and help staff"

(see Appendix 8a and 1/86 school visits notebook in research database)

The major factor in successful development of science activities within the classroom was obviously the change in the relationship between the headteacher and his staff on his return. During his secondment he had visited many other schools and the course member felt that he

"now felt secure in his school and with science education"

(see Appendix 8a and 1/86 school visits notebook in research database).

As a result of these factors the course member was able to organise workshop activities, in-service events and have release time to enable her to leave her class and assist other staff in school, all of which are recognised (D.E.S. 1989b &1992) as a common factor in the dissemination and provision of good science education. My impact as evaluator on this key area was secondary in that efforts had not been made to directly change the way in which teachers organised science. I was able to support the course member and give assistance in the numerous and at the time seemingly unsolvable problems concerned with her relationship with her headteacher. It was hoped that by supporting her in this way and encouraging full participation of the headteacher in the course that he would see the benefits of science education and assist in its implementations and organisation within his school.

The key area of resources was one in which as evaluator I had some impact The school was very well resourced for science. There was a central room where all equipment was kept and there was in addition a great number of resources evident in each classroom. The £700 that the headteacher had allocated for science at the time of my previous visit (see Appendix 8a and 1/86 school visits notebook in research database) had assisted in improving resources to a very large extent and the school had purchased the 'Look!' scheme (Gilbert & Matthews 1981) and had been able to ensure that they had the resources to accompany it. My influence on resources was very marked and although it was welcomed it was quite unintentional. It was felt by the course member and myself that the headteacher had responded to the pressure to support science within his school to a greater degree by allocating such a relatively large amount of money for science provision.

Matching was an area that appeared to be receiving a high profile within the school at the time of the third visit. Teachers had been encouraged to review the science taught with a view to its suitability for the children concerned, although they had not been given any guidance as to how to tackle the problem, the headteacher feeling as does Harlen (1977) that there is "no recipe which can be offered for instant matching" (page 3). The D.E.S. course had spent considerable time discussing matching issues but it

was my feeling (and this was later confirmed by the course member) that the impetus for considering them came from the individual teachers and from the headteacher. The headteacher felt that at this stage in the staff's personal development in science teaching they were ready to question their teaching and evaluate to see if they were meeting individual children's needs. In the light of this discussion I felt that the major influence on matching in the school was the staff although they would not have been at the stage where they were ready to undertake such a task if it had not been for a number of factors which include the D.E.S.course and my interaction as evaluator.

The last key area was that of staff development. There had been tremendous improvement in this area in the years following the course. The course member convinced the staff of the usefulness of her policy despite it having been produced without staff consultation. The Education Reform Act (D.E.S. 1988) and the introduction of the National Curriculum in Science (D.E.S. 1989) had focused attention on science in the curriculum and had established it as one of the three core subjects to be taught in school. This obviously had a great influence on the staff. The course member had also attended several short courses to further assist her role as co-ordinator for science. The staff had adapted well to the new ways of thinking and were now beginning to develop further by looking at assessment issues. At the time of the visit the headteacher was in the process of submitting a proposal for the school to join the Nottingham Technology Project. The head saw this as being an extension of the school's development by assisting them to extend the weakest part of their science education, that of technology and problem solving[3]. However the visit to the school indicated that the staff were already using open-ended, problem solving approaches in a technological way. For example one fourth year class were involved in a topic on bridges during which they designed and made bridges, adapting them to suit their own specifications.

The D.E.S. course and my interaction as evaluator had provided the initial impetus to increase the course member's confidence and expertise and subsequently enabled her to consider staff development. Its continuing success however was the result of a number of differing factors such as the national awareness of science in schools and the headteacher's improved support.

---

[3] At this stage in the development of the National Curriculum, technology was part of the science remit.

3.4.7 Summary

In this particular school the D.E.S. course's input originally appeared to be wasted as it was collectively felt by myself, the course member and the course leaders that without the headteacher's support little could be achieved. At the time of my second school visit I wrote in the school visits notebook

"without support from HT it would appear unlikely that a new policy will succeed and that science throughout the school will improve"

(see Appendix 8a and 1/86 school visits notebook in research database).

As evaluator my role was mainly to encourage the headteacher to consider science as a priority within the school and to give science his full support. At this time the role of evaluator had fully developed into that of the interactionist evaluator and it was felt to be extremely important to build up some kind of positive working relationship with the headteacher. This I found to be almost impossible and despite my support and the considerable efforts made during the year of the course by the course leaders and myself, I fully expected the school to be stagnant as far as science development was concerned. I would very much like to say that the improvements that had taken place over the two years since my previous visit were initiated by my involvement with the school, but whilst my encouragement was undoubtedly one contributory factor, I am sure that as the course member felt that the major factor was the headteacher's secondment and his new "mellow" nature and increased confidence (see Appendix 8a and 1/86 school visits notebook in research database). I was especially impressed with the headteacher and staff in accepting and using a policy (however good) which they had no part in developing. My involvement as evaluator was a useful experience both for myself and for the course member as it gave us experience in handling difficult staff. The course member especially felt better equipped to deal with problems in the future with her headteacher and staff, problems that she would have found difficult to solve without outside help.

3.5 CASE STUDY 3

This case study re-emphasises the point made in case study 2 that strong personalities can affect the long term impact of courses. It also shows how national changes affected the courses described here and impact within schools. More importantly it illustrates the importance of support for the course member. Through my interaction with the course member and the school I became convinced not only of the need for support to assist the development of science but also the role the evaluator can play in providing that support. I believe this support can take two forms, actual provision of support during interactions and arranging support by others.

3.5.1 The School.

The school in this case study was involved in the second course run at Trent Polytechnic (now The Nottingham Trent University), the 3/85 Primary Science Consultants Course (see footnote page 5) and was visited over a four year period from 1986 until 1990.

The school is situated in the north of Nottinghamshire in what was originally a small mining area that has become much larger in recent years. The children live in an area of poor housing including a large council estate, consisting of mainly white families. The staff indicated, in informal discussions, that the children are boisterous, are often poor achievers and that there are a large number of children who are in care or from very deprived (emotionally and financially) backgrounds.

The school is a Junior school situated on the same site as a separate Infant school. At the time of the evaluation visits contact between the schools had been limited but was improving. The school buildings are large, built during the 1960s. There were at the time of the first and second evaluation visits thirteen classes in the school although the buildings can accommodate nineteen classes. There is evidence that school size has little or no effect on school achievement (D.E.S. 1967 and A.P.U. 1981) but that the socio-economic factors, which affect the environment, and parental attitudes do (D.E.S. 1967, Open University 1972 & Wedge & Prosser 1973).

The course member was a young married lady obviously dedicated to teaching and very intense about science. She was however lacking in confidence and humour and therefore found it difficult to form relationships with the other adults on the course. The headteacher was a young, female career head who was full of vitality and encouragement for her staff.

3.5.2 Science in the school prior to involvement on the course.

The course member whilst an enthusiastic, fastidious and extremely hard working member of staff, was lacking in confidence. She had a degree in bio-geography, but felt she was weak on the physical sciences. She wrote in the initial evaluation questionnaire (see Appendix 3) that she hoped the course would emphasise the "physical sciences/C.D.T to improve " her "own confidence and expertise in this field". (see 3/85 school visits notebook in research database)

Physical science is an area which is felt to have been weak nationally (H.M.I. 1989) despite initiatives to enhance it, one of which included 35 day courses such as the one this teacher had embarked on. Since that time, some improvement has been noted by the D.E.S. (1991) with the introduction of the National Curriculum and it is an area of continued focus on current designated science courses (D.E.S. 1992).

This school was therefore not substantially different from many other primary schools at that time. In the initial evaluation questionnaire the course member thought that the other staff members had mainly a social and biological science background to 'O' level standard but felt they were lacking in confidence on how to teach science in the classroom. She wrote in the initial evaluation questionnaire (see Appendix 3),

"I hope to be able to re-design our science scheme to give more flexibility of approach and encourage colleagues to be more positive and adventurous"
(see completed questionnaire in research database).

The school had their own environmental studies policy document, which reflected their expertise and was

"biased towards scientific method".
(see completed initial questionnaire in research database).

At the time of my first visit the science taught emphasised the staff's strengths in environmental science with some practical work arising from their studies, but as the course member identified in the initial evaluation questionnaire (see Appendix 3) there was

"not much of the investigative approach used"
(see completed initial evaluation questionnaire in research database)

This is the type of science, of an open-ended, pupil initiated type, which projects such as the Open Ended Science Project (O.P.E.N.S. 1990) have been developing. Since the introduction of the Science National Curriculum (1989) it is, to some extent, incorporated into Attainment Target 1 although evidence is (D.E.S. 1989b) that this continues to be a difficult area for schools. In my discussions with the headteacher she hoped that this investigative approach would be developed in time and she agreed with Harlen (1985) that children should be encouraged

"to find out for themselves"

(see 3/85 school visits notebook in research database) .

Science 5-13 (Schools Council 1967-74) was used as a teacher resource and Science Happenings (1969-1970) and Sciencewise (Parker and Ward 1977-1979) were also used in the school. The extra classrooms in the school allowed them to convert one into a large science resource room beautifully set out with probably all that is necessary to teach science at primary level.

The course member had been given two hours per week to assist the development of science and she used this time to prepare and teach science to classes alongside the class teacher. It was evident from both the course member and the headteacher that science was a priority area and that its development was supported in terms of money, resources, space and time (see 3/85 school visits notebook in research database).

The rest of the staff had already used her

"as a consultant"

(see 3/85 school visits notebook in research database).

and had begun to consider the teaching of science in a positive way. She had developed a science policy that had been in use for three years. Science content was divided between the year groups and then subdivided into categories for example, Materials, Living Things and Forces. Teachers were expected to choose something from each of these categories to incorporate into the term's work. Included in each category were examples of approaches, suitable resources available within school including books and television programmes. It was a very detailed policy and although balanced in terms of physical/biological sciences did not reflect what was being taught within the classroom. The course member felt it was

"quite rigidly structured"

(see completed initial evaluation questionnaire in research database).

and had the disadvantage that any area not tackled because of its lack of relevance to the class topic would not necessarily be met at a later date. As the policy did not require any record keeping of areas covered this made continuity difficult. The course member hoped that the course would give her the confidence and expertise to

"redesign school science to give more flexibility of approach and encourage staff to be more positive and adventurous ie. encourage self-generated investigative work"

(see 3/85 school visits notebook in research database).

3.5.3 Science in the school at the end of the course.

The visit took place a year after the initial visit and during this time the staff had remained very stable. There had been one new member of staff half way through the year. The headteacher anticipated that this would change over the next year and I wrote in my school visits notebook at the time that,

"a number of staff are applying for promotion so the situation could be quite different at the end of this academic year"

(see 3/85 school visits notebook in research database).

The headteacher felt that the interest in science amongst the staff had grown, together with many other curriculum areas. My school visits notebook recalls that

"All staff have expressed a wish to be involved in curriculum development and so this has slowed progress to some extent because the discussion groups are large, but hopefully if all staff are involved then at least any development will have maximum impact "

(see 3/85 school visits notebook in research database).

This is a view that is also held by Gilbert & Matthews (1984) who feel that if staff have collectively agreed decisions they are more likely to implement them.

The course member although originally very competent had developed more fully, as a primary science specialist, as a result of the course. She felt that although she

"would have been happier if her own level/knowledge of science had been improved"

she had made

"enormous personal improvement in management skills, organisation of science, the development of a workable policy and especially in confidence"

(see 3/85 school visits notebook in research database).

I wrote in the school visits notebook at that time that within her classroom, the course member taught

"more CDT & problem solving"

as a result of the course and within the school there was

"an on-going development which to date has been quite rapid"

(see 3/85 school visits notebook in research database).

All the staff had subsequently benefited by her self-improvement as she had been very quick to share new ideas with her colleagues, arranging after-school workshops to discuss and try out some of these ideas, working alongside colleagues in planning and delivering balanced science through topic work and preparing and presenting a five page discussion document on science which when analysed gave her indications of how best to proceed and what needed tackling first. This document and the course members subsequent analysis can be seen in Appendix 7. She also had prepared some

ideas (see Appendix 7) to assist teachers in the introduction of problem-solving activities with guidance on the kinds of outcomes to foster and on how to record children's observed responses. The staff had held a number of in-service sessions during which they had developed a skills check list as a basis for topic development. This utilised the wheel system of record-keeping and was not confined to science as many of the skills were felt to be cross-curricular, a relationship recognised as important by others (Harlen 1977 & Schools Council 1983). It was hoped that by using this system in topic work

"a balance will occur and all the necessary skills will be developed"

(see 3/85 school visits notebook in research database).

A similar system was planned for development at a later date to incorporate concepts and attitudes.

The benefits to the classroom were felt to be immense. Science was more investigative in nature,

"originating quite often from the children themselves"

(see 3/85 school visits notebook in research database)

and there was evidence of greater use of technological ideas. For example, one class had made working models to show how joints work during a topic on Ourselves. The school had been involved in an Industry Project and this was also felt to have assisted development especially in the physical science area. The result of the school's development was that the course member's release time per week had been reduced to one hour to enable her to

"help teachers in their planning for next term."

(see 3/85 school visits notebook in research database).

The course member hoped that in the future developments would

"progress along the right lines"

(see 3/85 school visits notebook in research database),

and that she could develop links with the Infant school, one of whose members of staff had at that time just begun the D.E.S. 1/86 Primary Science Consultant's Course at Trent Polytechnic (now The Nottingham Trent University). To facilitate these links she was hoping to be able to teach a class of first year Junior children (Y3) and this would mean she would

"have close links with the transition of children"

(see 3/85 school visits notebook in research database),

and assist continuity and progression within the whole Primary phase. A recent survey (D.E.S. 1989b) indicated that at Key Stage 1 the science co-ordinators were mostly teachers of the older children in a school. Evaluations of D.E.S. courses at Trent (now Nottingham) Polytechnic (Johnston 1986, 1987, 1988, 1989) indicate that

this may also be a feature at Key Stage 2, and so it is welcoming to see an initiative to the contrary.

3.5.4 The effect of the Interactionist Evaluator.

This particular course member was unusual in that she began the course extremely competent in science and having already established a working policy which although very rigid was a good basis for discussion and development. She had however very little confidence in her own abilities and expertise to introduce science effectively, a feature according to Gilbert and Matthews (1981) to be fairly typical of primary school teachers. She was also very lacking in the interpersonal skills that would assist her to manage other teachers effectively. Her efficiency was quite daunting on occasions and the headteacher and deputy headteacher indicated that other staff not familiar or confident with science had been intimidated by her approach to curriculum development (see 3/85 school visits notebook in research database).

The D.E.S. course enabled her to appreciate her own skills and gave her confidence in her abilities as a scientist. However, throughout the course and the evaluation visits she produced written documents for discussion and approval, asked for advice and generally appeared to need reassurance that she was capable of the tasks she was undertaking. The main obstacle to success in developing further the school's science policy was her approach. The headteacher was very supportive throughout the course but was obviously aware of the course member's limitations. On one occasion when the headteacher felt that the course member was making excessive demands on the staff she requested that no further pressure should be put on the staff until a later date. The course member wrote this comment in her analysis of her discussion document in science

> "I prepared a plan of action beginning with the autumn term and discussed this with the headteacher at some length. She was at some pains to emphasise that she did not wish the staff to be put under any further pressure that term so nothing would be started until September."
>
> (see discussion document in research database and Appendix 7)

This set-back had allowed the course member to consider the steps she was going to take, discuss them with the headteacher and with myself and subsequently produce the discussion document (see Appendix 7) quoted above. When analysed, this document, indicated the best way to proceed. By the time she actually began to work with the staff she had realised that her approach had on occasions been hindering development.

As evaluator my role was one of support (an example of positive interaction as defined by Interactionist Evaluation, paragraph 4.1.6), giving advice and reassurance that development was a slow process and one that was facilitated by full discussion and co-operation of staff and not by coercing them to move at a rate at which they felt uncomfortable.

At the time of the second visit to the school the course member was still impatient at the speed of development but had learnt that to pressurise the staff was not the way to succeed. The D.E.S. course, headteacher and myself as evaluator all played important roles in achieving this, for as the headteacher indicated at a later date we were

" able to give .... greater confidence to tackle necessary changes".

(see 3/85 school visits notebook in research database)

3.5.5 Science in the school three years later.

The school had been affected by falling rolls and during the previous three years had lost three classes, making it now a ten class school. They did however have a very large staff for the school, with ten full-time class teachers, one full-time community teacher, one full-time special needs teacher, three part-time teachers (all with their own classrooms) and the headteacher. Additional rooms were used for two libraries (one fiction and one non-fiction), three core subject resource rooms and two halls.

There had been some staff changes during the three years although the headteacher, deputy headteacher and science consultant/course member had remained. Three other teachers had been promoted and not replaced due to falling roles. The headteacher had been ill for one term and this resulted in the deputy headteacher being acting headteacher for the term.

Close links had been forged within the family of schools, especially with the Infant school which is on the same site and whose science consultant attended the D.E.S. course following that which this course member attended. These closer links were in part due to the D.E.S. course but were also due to a large extent to the introduction of the National Curriculum and time allocated by the local authority for liaison. In the past, liaison between schools whilst recognised as important (D.E.S. 1967) has been minimal because of the lack of release time. The time that has been allocated for such purposes may have the effect of improving continuity and progression throughout compulsory education. For this school these changes meant that issues such as

continuity and progression had begun to be tackled. The course member had been teaching lower Junior children (Y3 and Y4) and visited the Infant school on a regular basis which she felt made

"transition somewhat easier".

(see 3/85 school visits notebook in research database).

At the time of this visit the school had just completed an involvement with the Primary Science and Technology Project in Nottinghamshire which the headteacher felt had

"assisted them to continue that development"

(see 3/85 school visits notebook).

One of the most important influences was the national changes which had occurred in science provision. The National Curriculum in Science had been introduced the previous year and this had changed many teachers' attitudes to science. It was now a subject recognised as having equal status with Maths and English and this had an effect on many of the schools visited at that time (see school visits notebooks in research database).

3.5.6 Key areas of development.

There are two key areas (see footnote page 10) where my role as an evaluator positively influenced development, whilst there was one area where I attempted to influence development without apparent success (see Tables 1 and 2, pages 90 and 91).

The organisation of practical investigation is one key area where my interaction had some effect. The course member had been involved with a number of initiatives within the school to assist the development of organisational skills. These included using release time to plan science activities with staff and to assist in overcoming the organisational problems that they experienced in their teaching. Planning science activities were regarded in the school as of the utmost importance, a view shared by the Assessment of Performance Unit (1983 & 1986). Sensible planning was felt by the headteacher to lead to a balanced curriculum ensuring continuity and progression throughout the school and it was during planning sessions with the course member that organisational problems were discussed. The course member felt that her success in dealing with staff problems had been greatly assisted by the D.E.S. course and the help and reassurance that she had from the course leaders and from my interaction as evaluator.

Staff development was considered by the headteacher and myself to be the area of greatest success. The D.E.S. course and my input as evaluator were able to give the

course member the confidence needed to help her to make the necessary changes within the school. Coupled with this increase in confidence was her changing attitude towards managing the staff. The headteacher felt that she was now less likely to

"frighten people by her intensity, efficiency and knowledge"

(see 3/85 school visits notebook in research database),

and would be able to manage people in a calmer manner, being

"now confident enough to stand back"

(see 3/85 school visits notebook in research database).

She had prepared and led staff workshop sessions and in-service days which initially made the staff aware of science and how it could be approached, and later looked at other issues such as planning for continuity and progression and matching.

The release time given to the course member to work alongside staff and assist in science planning and organisation, and later planning alone had been well used and the benefits to the staff were evident during my visit as indicated by the high level of primary science in the children's work and from discussions with the children and staff.

Assessment and monitoring was perhaps the school's weakest area of development and one that I unsuccessfully attempted to influence. The headteacher stressed during evaluation visits the importance placed on planning and felt very strongly that good planning comes before record-keeping and assessment and not as is generally accepted (D.E.S. 1985 & S.E.A.C. 1989) alongside good planning. The planning records together with the register of attendance were felt to be sufficient to ensure continued and progressive coverage of the National Curriculum, which had been implemented the year before my final visit. At this time the school was considering joining a project on recording and assessment, since the headteacher felt the school was at a point in its curriculum development when such an input would be of benefit.

The D.E.S. course spent some time in discussing and reviewing recording and assessment strategies and the course member sought advice during evaluation visits on how best to proceed. She had some good ideas which after consultation with me she attempted, unsuccessfully to put into practice. The reason for her lack of success was the headteacher's determination that planning was to have prior importance. My assistance in this key area had very little impact with such a forceful argument and a very determined lady. Despite the lack of progress in this area, the school at the time of my last visit felt confident that they could now consider these issues, even if they did not become part of a Nottinghamshire project specifically designed to look at them.

3.5.7 Summary.

In looking at the key areas of development it may be felt that the effect of the evaluator was minimal in all but one area, that of staff development. However on careful consideration it could be argued that improvement in that area had a profound effect on a number of the other key areas. The development of good interpersonal and managerial skills are essential for without them it is difficult to gain the full co-operation of your staff and this is necessary for successful curriculum development (D.E.S. 1967 & Schools Council 1983). The course member's improved skills enabled her to assist her colleagues in organising their practical investigations, using the schools resources to the full, developing their skills in matching activities to children's abilities and considering the issues of assessment and monitoring of children's work . All this was done without the antagonism which had marked the course member's previous attempts at initiating change within the school. However in considering the success in staff development, praise should go to the quiet determination of the headteacher who having many of the qualities of the course member also displayed considerable tact in dealing with the course member and the rest of her staff and helped the course member by example. The development of this course member in the four years I was involved with her convinced me of the importance of the support she received and my part in helping to provide that support. The most important support was that of her school, and especially her headteacher, who allowed her time to develop, gave her the benefit of advice and encouraged the use of outside agencies involved in projects which would help not only her but the whole school.

3.6 CASE STUDY 4.

This is another case study which clearly demonstrates the need for good relationships and support in managing change. It illustrates a failure in terms of continued development in science because of new and unforeseen influences and decreasing support in the school context. Through interaction with the school I gained valuable insights into the vulnerability of school developments, and realised the need for consistent and structured support which as evaluator I was unable to provide. Additionally, this case study demonstrates the usefulness of case study methodology in evaluating the long term impact of courses, as this school could have been regarded as a success using another methodology.

3.6.1 The School.

The school was built about twenty years ago in the middle of a mixed (privately owned and council housing) estate in a suburban area. It is an Infant school with a separate Junior school some distance away on another part of the estate. A member of the Junior staff had attended the course during the previous year and it was hoped that both schools could develop science along the same lines and with improved communications. The school was therefore chosen to provide evaluation data concerning the development of science in neighbour schools and to ascertain the relevance of the course to Infant teachers. Both these issues had been raised during the previous year of the evaluation, or as Glaser and Strauss (1967) believe they were emerging theories which are grounded in data. Chosing the school specifically to look at these theories is an example of Glaser and Strauss' (1967) technique of theoretical sampling which is described more fully in paragraph 3.2.1. There were eight classes in the school of mixed ability and grouped vertically.

The course member attended the second of the courses run at Trent Polytechnic (now The Nottingham Trent University), the D.E.S. 3/85 course (see footnote page 5) and was visited between 1986 and 1990. She was the deputy headteacher in the school with overall responsibility to

"encourage, guide and help other members of staff with the problems they encountered and to keep abreast of new curriculum ideas."

(see completed evaluation questionnaire 1 in research database and Appendix 3b)

On the initial evaluation questionnaire (see Appendix 3a) the course member indicated that she had studied Biology as her main College subject and had been teaching for thirty years. Data from this questionnaire can be seen in Appendix 3b. The

headteacher was an elderly lady who was very enthusiastic in her support of the course and the work that her deputy did within school. There was also, in the school, another teacher with specific responsibility for science.

3.6.2 Science in the school prior to involvement on the course.

Apart from the course member and the science consultant's interest in science the staff had no real expertise in primary science, although the initial evaluation questionnaire indicated that the

"rest of the staff " are "keen to include any science work relevant to topic work"

(see completed evaluation questionnaire 1 in research database and Appendix 3b)

In this questionnaire she gave examples of the type of science that she included in her topic and these can be seen in Appendix 3b. The work included Harvest, Time, Gravity and Water which involved the class in some problem solving and technological activities.

During the first school visit I was informed that the school did not operate a scheme for science education but it was expected that their local education authority would produce guide-lines and the school was waiting for these before proceeding with their scheme (see 3/85 school visits notebook in research database). Science was taught in individual classes within the topic framework although the course member wrote on her initial evaluation questionnaire that the staff

"may not in actual fact consider the work they do as 'science' although it fits into this category"

(see completed initial evaluation questionnaire in research database and Appendix 3b).

During the first school visit I focused on the school's existing practice in, and commitment to, science with the headteacher and science consultant. The course member in the initial evaluation questionnaire had written that whilst science

"was given equal importance....some teachers are more enthusiastic and aware of its importance than others"

(see completed initial evaluation questionnaire in research database and Appendix 3b).

The headteacher felt that their teaching had a

"nature bias" with "good observational and recording skills encouraged"

(see 3/85 school visits notebook in research database).

Additional science was taught with Year 1 and 2 children through class demonstration with "the science consultant 'going' round each class"

(see 3/85 school visits notebook in research database).

The school did not as a whole feel very confident with physical science nor with

"construction, C.D.T. etc."

(see 3/85 school visits notebook in research database).

At that time these were areas generally neglected and ones which the thirty-five day courses and later twenty day courses sought to address (D.E.S. 1989c).

As most of the topic work in science depended to a large extent on the teachers' enthusiasms there was a danger, as identified by the D.E.S. (1985), that not all the children in the school would have a consistent introduction to science. The staff were however keen to integrate science further into their topic work.

Resources within the school were very poor, a situation found to be common to many schools within the local education authority through a study of science provision at that time (Guest 1985). The course member wrote in the initial evaluation questionnaire that she hoped that the course would provide her with

"a new enthusiasm, a fresh approach to my own teaching, and hopefully new ideas to communicate this to the rest of my colleagues"

(see completed initial evaluation questionnaire in research database and Appendix 3b).

She also hoped that she would be able to

"liaise with Junior School whose deputy attended last years course"

(see completed initial evaluation questionnaire in research database and Appendix 3b).

3.6.3 Science in the school at the end of the course

The area surrounding the school had been subject to considerable growth and the school had an additional class and teacher. The science consultant was due to leave at the end of the term, but otherwise the staff had remained stable. The school had been part of an E.S.G. project for two terms and the headteacher felt that there had been development as a result of this involvement. The whole school had focused on science such that development had progressed to a situation where there was a great deal of 'hands on' work proceeding from an organised approach to effectively teach science, rather than the 'ad hoc' approach previously used (see 3/85 school visits notebook in research database). Within the course member's class there was an attempt to ensure that science was an integral part of each topic whilst maintaining some kind of progression. This had not as yet been fully developed within the whole school and I wrote in my school visits notebook at that time

"not all 'good' science going on in every classroom"
(see 3/85 school visits notebook in research database).

Resources had improved, with a science trolley being used and useful books having been catalogued to complement science activities. A school policy for science was still very much in its infancy with ideas on continuity and progression only just beginning to take shape despite national encouragement (D.E.S. 1967, Schools Council 1983, D.E.S. 1985). I wrote in the school visits notebook that the

"science policy is very vague. No thoughts as yet on monitoring and assessing skills/attitudes etc. more concentrating on finding science in topic work"
(see 3/85 school visits notebook in research database).

The school had adopted a system of record keeping which listed the topics done at each level, but such records were not particularly welcome in the feeder Junior school and indeed no information on the children and their progress was requested on transfer. Despite the need for good liaison between schools (A.P.U. 1978, Guest 1985 & Craig & Fisher 1987) and the course member's hopes, relationships with the Junior school had not improved during the year.

3.6.4 The effect of the Interactionist Evaluator.

The course member was in a very different position from her colleague on the D.E.S. course in case study 3, in that she began the course with little expertise in science, despite her background. The problem of mixed group teaching on science in-service courses was one shared by other courses (Frost & Turner 1987). I was able to monitor course members to ascertain whether both the teacher with considerable expertise and the teacher with poor expertise and confidence could both develop fully through involvement on the course. This school was also interesting from the evaluation point of view because being an Infant school, I would be able to ascertain the effect of changes in the course structure to better accommodate teachers at Key Stage 1, a theory generated by interaction with the school in case study 1 and other schools on the 3/85 course.

This was a time of growing interest in science but in many instances teachers were in need of continued support after their involvement in curriculum initiatives. This type of support was urged by Guest (1985) in his report of science in Lincolnshire primary schools. In this school, although the staff were enthusiastic and supportive, they were as a whole in need of considerable guidance and support to overcome their lack of science expertise and to develop the school's science effectively. As evaluator my

role was one initially of support and advice, encouraging them to seek further support which they successfully did in the form of the E.S.G. and encouraging them to develop closer links with the Junior school which they did not achieve.

At the time of the second school visit there had been considerable development in science despite the traditional slow nature of change in education prior to the introduction of the National Curriculum. The staff were extremely confident about the school's development and were convinced, at that time, that they would consolidate the work already undertaken and that greater changes would take place during next year. I too was confident that this would occur but encouraged them to continue to seek out other areas of support, for example contact with other course members and particularly links with the Junior school. My role was therefore one of positive interaction (see paragraph. 4.1.6) providing support and encouragement in order that a climate could be established where continued development would be facilitated.

3.6.5 Science in the school three years later

During this visit it was apparent that the school was experiencing considerable change both internally and externally. This was the first year of implementation of the National Curriculum at Key Stage 1 and therefore Infant schools were very busy adapting to the national changes. Within the school the old headteacher had retired the previous year and the deputy headteacher (the course member) had been acting headteacher for one term. Prior to the original headteacher's retirement the school had remained stable, or in the words of the new headteacher

"almost stagnant"

(see 3/85 school visits notebook in research database).

When the science consultant had left just after the last evaluation visit, responsibility for science was given to another member of staff and had remained with her since then. At the time of this visit the course member was on extended sick leave and I spoke with the new headteacher and new science consultant about developments in science. During these discussions it was apparent that the relationship between the new headteacher and the course member was extremely poor, with the headteacher describing the course member as

"a negative person, prone to emotional swings".

(see 3/85 school visits notebook in research database).

The headteacher implied that the course member would like to leave the school and that she would welcome this.

Indeed she also implied that

"the governors might act because of her prolonged absences".

(see 3/85 school visits notebook in research database).

The local area had been subject to change too, with considerable building development and many new, large houses being built. The new headteacher said that this had not significantly affected the school as its

"poor reputation and the Junior school's worse reputation"

(see 3/85 school visits notebook in research database).

had meant that many parents chose to send their children to school elsewhere.

The new headteacher had in her two terms in the post initiated new plans for science with especial emphasis during that term.

After this visit I attempted to contact the course member to verify the situation by writing to her personally through the school. The reply came from the headteacher who had intercepted the letter. She wrote

"I am replying to your letter dated 11th September addressed to..... *(course member)* who is on long term sick leave. .....*(course member)* has been absent for much of the preceding two years and I therefore feel that her involvement in your course has had little impact on the curriculum in this school. When you visited us in March, ... *(the science consultant)* did tell you that .....*(course member)* drew up a science policy immediately after the course."

(see letter in research database).

3.6.6 Key areas of development.

In this case study the key areas discussed (see footnote page 10) are ones in which the evaluator was unable to effect in the long term (see Tables 1 and 2 pages 90 and 91).

The schools involvement in the D.E.S. course resulted in a policy document being written by the course member and the previous science consultant. The new science consultant who had a different post of responsibility at that time said that this was done with

"no consultation of staff and so its impact was nil" and it "was then put away and left"

(see 3/85 school visits notebook in research database).

Any impact that I may have had on the development of a school policy was obviously left with the policy! Many of the planned developments such as the inclusion of more physical science and better continuity and progression were felt by the new headteacher not to have occurred (see 3/85 school visits notebook in research database). The lack

of science provision, despite the considerable initiatives to develop it, has been symptomatic of many of our primary schools, as is poor continuity and progression (Schools Council 1983 & D.E.S. 1989b), which good provision and planning could rectify. Suggested reasons for failure to develop a successful science policy are a lack of support (Guest 1985) and lack of time for planning (D.E.S. 1989b), although in this case poor relationships within school and the uncertain educational climate were possibly additional factors.

During the renewed emphasis on science, each teacher had produced a two year plan and science was taught through 'science topics'. The new science consultant felt that the next stage would be to plan science through topics other than science biased ones. The headteacher's feelings were that this stage would be one that, considering the staff, would need

"a great deal of time and careful management".

(see 3/85 school visits notebook in research database).

Since this visit did not include a tour of the school it is difficult to say realistically how the school had improved in organising practical investigations. However the headteacher and science consultant felt that there were considerable opportunities for improving the way in which science was organised (see 3/85 school visits notebook in research database).

A two year plan for science topics had focused the teacher's attention on science and the way in which it was taught, but the science consultant felt that she needed additional support from the local education authority to continue the work of the E.S.G. team and to initiate investigations of the open-ended, problem solving type. The need for careful planning and organisation on the part of the teacher in order to allow children to conduct open-ended investigations is argued by Harlen (1985 & 1985a) and it is probable that the school would need continued support to enable them to do this. The support given by the evaluator during initial visits and the greater support by the E.S.G. team was obviously not sufficient to enable the school to continue to develop organisational skills. During this visit I encouraged them to seek out further support from the local education authority.

Despite the importance of matching children's activities to their abilities in order to encourage them to make the next conceptual step (D.E.S. 1967, Harlen 1977 & Harlen 1985a) it was an area of development not achieved to a large degree in this school. I did not actively encourage the school in this direction during early visits because I felt that they were working towards good matching by themselves. The headteacher and science consultant felt that it was an area that they were beginning to address and

hopefully would successfully develop teaching strategies to promote in the near future (see 3/85 school visits notebook in research database).

Good assessment strategies are unlikely to be developed to any extent at such an early stage in the development of science in the school. It is also unlikely to occur without successful matching which should accompany assessment. The headteacher was hoping to monitor the work being done as part of the classes' science topics and this it was felt would lead first to some kind of continuity and then to assessment of the work undertaken. It was hoped that the National Curriculum guide-lines from S.E.A.C. (1989) would assist the school in this area of development.

Staff development was an area of spasmodic and not always successful development. The D.E.S. course led directly to the course member and previous science consultant formulating a policy but without staff involvement. The present science consultant said that there had been no attempt to involve staff in staff development activities and discussions in order to improve science. The headteacher felt that the course member was

"not capable of developing curriculum needs in the manner that she felt a deputy headteacher should"

(see 3/85 school visits notebook in research database).

The previous and present science consultants, until the appointment of the new headteacher had simply shared ideas from the E.S.G. team but had not attempted any science development initiatives. The present consultant said that the old headteacher was not supportive and this limited what she was able to achieve (see 3/85 school visits notebook in research database).

The school, although now beginning to look at its problems was still in need of a great deal of staff development. One avenue for this was felt to be links with school clusters. The relationship with the feeder Junior school had not improved significantly despite the fact that it's science consultant had been on an earlier course and the schools could have been a valuable source of support to each other. Links between individual staff members had been initiated but they were not matched by the hierarchy.

3.6.7 Summary.

There appeared to be considerable obstacles in the path of successful development in primary science in this school. At the time of my penultimate visit to the school I was convinced that the school was able to successfully develop science in all key areas as a result of the input they had had from the D.E.S. course and the E.S.G. team. It

subsequently appears that this input was not sufficient to continue the development already begun. It is possible that the science consultant should have attended the course and not the deputy head teacher, despite her role within the school to

"keep abreast of curriculum ideas".

(see paragraph 3.6.1 and completed evaluation questionnaire 1 in research database and Appendix 3b)

However, since there had been a change in science consultant, development may not have been aided by this. It also appeared that continued support was needed; support as argued at the time by Guest (1985) and recognised (D.E.S. 1992) as an important feature for the success of designated courses. Support via cluster arrangements appeared to be non-existent and although these have been said (D.E.S. 1989b) not to provide the support of sharing expertise and workloads, improved liaison would have the benefits of providing continuity and progression (D.E.S. 1967 & 1985) through planning together as well as increasing confidence and overcoming fears.

The role of the headteacher in ensuring science development has been stressed (Craig & Fisher 1987) and it is probable that both headteachers in this case hindered science development in their own way. The importance of relationships is stressed by many researchers (Denscombe 1983, Hitchcock 1983, Measor 1985, Walker 1985, Benson & Michael 1987 & Vulliamy, Lewin & Stephens 1990) and is discussed extensively later in this thesis (see paragraphs. 4.1.3 & 4.3.2). In this case it appeared that relationships within the school had broken down to a very great extent and this had an effect on science development. Outside support could alleviate some of these problems, but since they occurred sometime after the school's involvement on the D.E.S. course it would have to come from within the local education authority and not from the evaluator or the course.

To some extent the difficulties that the school subsequently experienced in developing science could have been exacerbated by the national changes that were occurring at that time. The years prior to the implementation of the National Curriculum left schools very apprehensive about the way science should be developed, what the content of the National Curriculum would be and the percentage weighting in terms of time that would be allocated to science. Schools responded to this uncertainty in two ways. Some made immediate changes to their provision and modified them with each new discussion document, whilst others waited until decisions were finalised. This school appeared to be in the latter category. The first year of the National Curriculum, during which the final visit occurred, did not clarify all the uncertainties, as schools found interpretation of the documentation difficult and this had added to this schools problems.

My interaction with this school convinced me of the important role case studies can play in highlighting progress and difficulties over a long period of time. I am convinced that using another methodology which did not evaluate the school's science development over a long period of time, I would have been assured of the successof that development. However the case study methodology in this context involved studying the school over a longer time and this highlighted unforeseen problems and enabled me to analyse these and consider the factors that affected them and the implications for the courses with which I was involved.

3.7 CASE STUDY 5

The school described in this case study was involved in the D.E.S. 9/87 Primary Science Consultant's Course (see footnote page 5), which was the last of the 35 day courses at Trent Polytechnic (now The Nottingham Trent University). At this stage in the courses, the role of the evaluator had become a truly interactionist one, as described in Part 3 of this thesis. For this reason the case study is an interesting one because the effect of the evaluator, however small, could be seen in many different key areas of development (see footnote page 10). Interaction with this school took place during a time of enormous national changes in education, with primary science being very much in the forefront of these changes and this was an additional factor influencing school development.

3.7.1 The School.

The school is an Infant school housed in a modern building in the centre of a small middle class village. At the beginning of its involvement with the course the school had five classes, one Reception Infant class taking rising fives the September prior to their birthdays, one transition/middle (Y.1) class in a team teaching situation with a class of middle/upper (Y.1 and Y 2) Infants and two classes of vertically grouped middle and upper Infants (Y.1 and Y.2). The headteacher and deputy headteacher were ladies in their fifties who both played an active part in the course, the headteacher mainly in the school and the deputy headteacher by visits to the course. The school was situated over fifty miles from the Polytechnic (now The Nottingham Trent University) and so these visits occurred despite the distance involved in travelling. The course member was a middle aged lady who through the initial evaluation questionnaire (see Appendix 3 and completed evaluation questionnaire in research database) identified her science background as having been good. She had trained as a secondary science teacher and had taught both Combined Sciences and Biology before changing to Infant teaching (see completed initial evaluation questionnaire in research database).

I visited the school on two occasions between 1988 and 1990, although I was in regular contact with the course member during her involvement with the course. The first visit took place approximately half way through the course. This visit was used to verify data about science prior to the school's involvement with the course which had been collected via the initial evaluation questionnaire (see Appendix 3) and through discussion with the course member during course commitments. During this visit I also collected data about the school's development in science and the effect of the course on that development. Details of this visit can be seen in Appendix 8b where an

extract from the 9/87 school visits notebook can be seen. The second visit occurred two years later after the implementation of the National Curriculum in Science at Key Stage 1 and considered the school's subsequent development and the long term effect of the course and evaluator.

3.7.2 Science in the school prior to involvement on the course

Apart from the course member, the staff had very little science expertise. The course member wrote on her initial evaluation questionnaire that the staff had

"very little science background, but interest shown. Little confidence"

(see completed initial evaluation questionnaire in research database).

This was a situation found to be common to many schools at Key Stage 1 at that time (D.E.S. 1989b).

The course member felt (see extract from 9/87 school visits notebook in Appendix 8b) that resources in the school were limited, although published resources included Look! (Gilbert & Matthews 1981), and Macdonald Science 5-13 (Schools Council 1967-74). During the first school visit the course member told me that she wanted to purchase additional resources but the headteacher was unwilling to spend money in this way (see extract from 9/87 school visits notebook in Appendix 8b). I subsequently spoke to the headteacher to ascertain her perception on this issue and to verify or refute this idea that she was reticent to purchase resources. I wrote in the school visits notebook at that time,

"H.T. says that..... is keen to purchase a large number of resources but she wants to wait until after the duration of course to decide which ones will be most useful. Then she wants to put a large input into science."

(see extract from 9/87 school visits notebook in Appendix 8b)

Science was taught within the school as part of the class topic and whilst the course member was confident that she was able to develop science out of the theme she felt that science was

"incidental in many classrooms"

(see completed initial evaluation questionnaire in research database).

The course member identified via the initial evaluation questionnaire (see Appendix 3) that she hoped

"to formulate a school science policy"

(see completed initial evaluation questionnaire in research database)

as a result of her participation on the course. She expected her school to benefit as a result of this policy by ensuring

"good practical science for all children appropriate to their age/development, providing "continuity and progression"

(see completed initial evaluation questionnaire in research database).

The headteacher, during the first school visit identified her expectations of the course as being

"To increase teachers confidence. Guidance on building up resources. Help to prepare curriculum for National Curriculum."

(see extract from 9/87 school visits notebook in Appendix 8b)

3.7.3 Science in school as a result of involvement on the course.

At the time of the first school visit a two year cycle of themes was in the process of being organised to

"ensure continuity and progression"

(see extract from 9/87 school visits notebook in Appendix 8b).

The curriculum areas to be covered within each theme were recorded using a wheel system and this can be seen in Appendix 9. The National Curriculum consultative document for science (D.E.S. 1988a) had been published a few months previous to this visit and this had influenced the thinking of the staff.

The teachers were now expected

"to provide a science content in balance with the National Curriculum"

(see extract from 9/87 school visits notebook in Appendix 8b).

During the visit, I saw evidence of good science in all classes and I gave examples in the school visit notebook

"science through music, hot and cold, balancing Santas"

(see extract from 9/87 school visits notebook in Appendix 8b)

although many were unaware that the activities they were doing were science.

I also wrote that despite the science work being undertaken

" the teachers were obviously lacking in confidence"

(see extract from 9/87 school visits notebook in Appendix 8b).

Part of the visit involved discussion on future developments with both the course member and the headteacher. The course member, whilst happy with the progress being made, was concerned that progression would end once the children left the Infant school, especially since links with the Junior school were poor. The headteacher asked me how I felt her school was

"achieving with a view to the National Curriculum"

(see extract from 9/87 school visits notebook in Appendix 8b)

and I wrote in my school visit notebook

"We discussed how best to prepare for Sept.'89"

(see extract from 9/87 school visits notebook in Appendix 8b).

3.7.4 The effect of the Interactionist Evaluator.

At this time course members on D.E.S. courses were generally much more aware of science in schools. In part, this was due to the introduction of the National Curriculum which had focused teachers' attention on the science provision within their schools. This school in particular appeared to be considering science in a positive way and monitoring of the course member and deputy headteacher during visits to the course indicated that a further visit at the end of the course would not be necessary. However, I was able, during the course commitment and during visits by the deputy headteacher to the Polytechnic, to enter into discussions on areas of concern. During the first school visit, when asked how the school was progressing, I was able to reassure the headteacher. In the school visits notebook (see Appendix 8b), I wrote

"I discussed my views"

of what was needed in order to prepare for the introduction of the National Curriculum and

"I also asked the headteacher to pass on my opinion of the staff's good progress"

(see extract from 9/87 school visits notebook in Appendix 8b).

This type of interaction would have been impossible for me at an earlier stage in the evaluation of the courses, but at this time the evaluation methodology had been carefully thought out and implemented. In this case the evaluation included deliberate interaction to improve confidence and achieve the desired aims, which is a characteristic of Interactionist Evaluation and is described further in Part 3 of this thesis (see paragraph 4.1.6).

3.7.5 Science in the school two years later.

I visited the school for a second evaluation visit nearly two years after the first visit described in paragraphs 3.7.2 to 3.7.4. There had been some changes in the school in the time since my first visit. Educational cuts had meant that they had had to lose one teacher and this was done through enforced redundancy, the process of which was long and unpleasant for the whole school. The results were that the school was not able to provide nine full terms of Infant education for all children. Reception Infants were now admitted up to 0.6 of a week, the amount negotiated between the school and the parents and depending on the children's abilities to cope. The other classes in the

school had been reorganised to leave one Reception class and three vertically grouped Year 1 and 2 classes (see 9/87 school visits notebook in research database).
True to her word on the occasion of the first evaluation visit, the headteacher had spent money on resources. There was a central resources area situated off the school hall. The headteacher informed me that an additional £175 had been given by the local education authority because she

"had put up a good case for money"

(see 9/87 school visits notebook in research database).

There was considerable evidence of science activities in all the classrooms, although one teacher commented that she

"resented the emphasis on science and felt stinted by having to teach science biased topics, although she realised that a great deal of other curriculum areas could also be tackled alongside"

(see 9/87 school visits notebook in research database).

I discussed this emphasis on science with other staff. The deputy headteacher commented that

"some good activities appeared NOT to fit into science in the N.C"

(see 9/87 school visits notebook in research database).

She had been finding planning and recording difficult areas and during absence due to a special needs course felt that her supply cover had difficulty in "picking up" science work and identifying the concepts to be covered (see 9/87 school visits notebook in research database).
The headteacher informed me that the school's main emphasis during the previous academic year had been science. At this particular stage in the development of the National Curriculum, that is 1990, this was a common emphasis for schools, as science had only relatively recently been identified as a core subject and the foundation subjects had not, as yet, been introduced. As a result science was a 'high profile' subject and this must have affected its development in school.
The course member had enhanced her science expertise, by being seconded to run courses for the local education authority Whilst she felt that this had

"further developed her own science expertise"

(see 9/87 school visits notebook in research database),

she considered that

"there was still much further to go in the rest of the school eg. science through an 'ordinary' non-scientific topic and liaison with the family of schools"

(see 9/87 school visits notebook in research database).

She did, however feel that support for development in school by the local education authority was weak as they were

"not necessarily using other trained D.E.S. course members"

(see 9/87 school visits notebook in research database).

This actually contradicted information received elsewhere during this visit regarding the support from the local education authority in the form of resources (see above). The school had actively sought other forms of support, such as a computer project which

"has involved some very good science"

(see 9/87 school visits notebook in research database),

and a computerised assessment project for which the staff had to identify

"targets within ATs for topics and assess them with children"

(see 9/87 school visits notebook in research database).

3.7.6 Key areas of development.

This school was involved in the last of the four courses being discussed in this thesis (see footnote page 5) and at this stage in the courses the role of evaluator had developed into that of the Interactionist evaluator as described in Part 3. As a result, my influence as the evaluator had some effect on all the key areas of development, but also because of national changes in science education there were other influences involved in development (see Tables 1 and 2 pages 90 and 91).

As science had been the main emphasis within the school for one academic year and there had been considerable involvement by the staff, a school science policy had been developed. The two year plan introduced at the time of the first evaluation visit was operated in such a way that the Reception children concentrated mainly on skills and attitudes desirable for science (that is developing Attainment Target 1). These skills would then be used to develop the majority of the other Attainment Targets in the National Curriculum during Year 1 so that the Year 2 children could repeat them using different topics. This was obviously easier to do than in some schools because each class was vertically grouped and had the same teacher for two years. However as described above in paragraph 3.7.5, one teacher commented to me that she felt limited by having to teach science biased topics although she realised that a great deal of other curriculum areas could be tackled alongside. I subsequently encouraged the headteacher and science co-ordinator to help the staff plan science through non-science topics. Considering the published material available (for example, Gilbert & Matthews 1981, Phipps & Churcher 1988 and A.S.E. 1989a), some of which the school had at its disposal, this was not felt to be a difficult task.

The beginnings of this policy were evident, prior to the schools involvement in the course. The D.E.S. course's input in terms of policy formation was thought to have finalised the school's outlines and my influence was merely one of agreement with the plans already made.

There was considerable evidence of progress in the organisation of practical investigations with good science evident in every class and children being able to tackle self-generated open-ended investigations (O.P.E.N.S. 1990). Most children worked co-operatively in small groups with little guidance from the teacher. To allow children to work independently involves considerable organisation and planning on the part of the teacher (Harlen 1985 & 1985a) and appears to indicate that the teacher has some confidence in what she is doing. There was some doubt as to the amount of time spent in discussing findings and further consolidation of concepts formed, activities encouraged by the D.E.S. (1985 & 1989) and this was an area discussed with me during the evaluation visit. As in many classes, time was the crucial factor and the lack of time was regarded as the cause of some limited follow-up discussion work.

Resources since the initial visit had been improved as expected. They were situated centrally just off the main hall. During the initial visit discussions with the course member and headteacher had indicated friction on the issue of money for resources, the course member being resentful of the headteacher's caution regarding money. I had not entered into extensive discussions on this issue, choosing the course of non-substantive interaction (see paragraph 4.1.6). However, through the discussion, tensions between the headteacher and the course member appeared to be alleviated.

Matching in science has been found (D.E.S. 1978) to be very poor in vertically grouped classes. This could be because of the wider age range and possible ability range of children. The staff in the school provided opportunities for the children to experience and explore their own environment, felt by Harlen (1985a) to be the chief aims of teaching science at Key Stage 1. They were also able to progress at their own rate, a situation found to be lacking in many schools at Key Stage 1 (D.E.S.,1989b). What was lacking was adequate opportunities for discussions, during which teachers could challenge the ideas that children present and attempt to make them question themselves (Harlen 1985a). Discussions about matching took place during the evaluation visits as a result of course inputs, it being an area which the school was hoping to consider in greater depth at a later stage. I had little impact on this area of development as little development took place.

Assessment and monitoring were areas felt to be weak at the end of the 9/87 course by most course members. This was ascertained by the final evaluation questionnaire (see Appendix 5 and 9/87 report, Johnston 1989). By the final visit the school was beginning to consider issues of assessment and monitoring along with many Key Stage 1 schools. It was felt that they would be assisted by the assessment project embarked upon prior to the second school visit. As a result of this project, some ideas on assessment had been formalised and it was felt that the publication of the S.E.A.C. assessment material (S.E.A.C. 1989) would assist them further in their development. Greater emphasis was felt to be needed on monitoring and recording and the deputy headteacher felt that the first exercise to facilitate this would be better planning. Whilst she was concerned that supply teachers were unable to continue the science work already started and were unsure of what concepts they was supposed to be developing, she felt that schools plans to ensure that the correct proportion of time was allocated to each curriculum area and detailed records on the achievement of each child, could be adapted to assist planning (see 9/87 school visits notebook in research database). Additionally, the links with the Junior school were felt to be poor and so they had not benefited from the records kept. However a new Junior headteacher gave the staff grounds for optimism and it was hoped that improved links would ensure that records of achievement were maintained, in order to ensure continuity and progression. During the second evaluation visit (see 9/87 school visits notebook in research database), the school was encouraged to look at planning and record-keeping in more detail in order to alleviate the concerns of some members of the staff and to develop links with the Junior school.

In the area of staff development the course member in particular felt that she had benefited from her involvement in the course and this was reflected by her involvement with local education authority science in-service work. She appreciated that the staff had developed considerably through her expertise but felt that there was still need for improvement particularly in terms of teaching science in a fully cross-curricular manner and in improving liaison with the family cluster groups (see 9/87 school visits notebook in research database). She was concerned like Guest (1985), that the local education authority were not necessarily using all other trained D.E.S. course members, partly because they appeared to have no system for recognising and using talents, and also because they relied heavily on the good will of participants in busy schools to be involved in in-service work. Generally the school had worked hard to develop their expertise in science, spending one year with especial emphasis on science and then seeking out further projects to continue that support. The course member was concerned that science emphasis could be lost completely because of the number of

curriculum areas that staff had to consider. As evaluator I encouraged them to continue staff development if possible in conjunction with other local schools, thus encouraging continuity as well as staff development.

3.7.7 Summary.

This school was in a similar position to its local education authority neighbour in case study 4 in terms of development at the same stage after the D.E.S. course. However, the school development in science was much more successful and this was due to a combination of factors. Factors that were different were:

1. The climate for development in primary science, which with the introduction of the National Curriculum for Science (D.E.S. 1989), was more favourable and encouraged swifter developments than schools had previously been used to. This was recognised in the evaluation reports of the 9/87 course (Johnston, 1989) when I wrote

   "the course this year has seen a great number of changes in science education nationally"

   (Johnston 1989 page 32)

2. The stable and supportive management of the school, encouraging staff developments and overcoming the concerns of the staff.

3. Identification of the school and course member by the local education authority for use in dissemination of knowledge through in-service events.

This last factor is perhaps the most important because the local education authority acknowledged the developments made within the school, which encouraged and supported the staff to continue to make progress. The school was also supported by the sharing of further knowledge with the course member whilst participating on in-service events. This goes someway to providing the kind of support envisaged by Guest (1985) and Frost and Turner (1987). The sustained development was as such not due to my role as evaluator but to the factors mentioned above. However interaction with me enabled initial developments to be discussed and to continue smoothly and it is difficult to identify the exact part played by any factor. It is difficult to distinguish the part played by individual factors in development of this kind, because of the complexity of any development. However, as discussed in paragraphs 1.1 to 1.3 case study methodology can highlight the context in which the differing factors interact and this can help in analysis.

3.8 CASE STUDY SUMMARY

These case studies and the description of the interaction which occurred during the evaluation have two main purposes. Firstly they attempt to describe the perceived effect of the evaluation interaction on certain key areas of development. These are set out in the footnote on page 10 and are discussed in paragraph 3.2.4. Secondly they attempt to describe some key influences on the development of the research methodology which is described fully in Part 3.

In the Case Study Introduction (see paragraph 3.2.3) I acknowledged the desirability of a skilled evaluator conducting qualitative research. I recognise as did Miles and Huberman (1983) and Yin (1984) that without the necessary skills the quality of the concluding data could well be poor. Many of the skills/techniques used during the evaluation interaction with the schools in the case studies were developed during that interaction. Some, for example, observation, use of questionnaires, looking for meaning in data and triangulation, were incorporated fairly early on whilst others are utilised and described within the case studies. They are additionally set out in the research audit in Appendix 10. As the evaluation methodology developed, these techniques became incorporated into the Interactionist Evaluation Methodology and this is further described in Part 3 (see paragraphs 4.1 & 4.2). It is possible that development in schools involved in the early course run at Trent Polytechnic (now The Nottingham Trent University), see footnote page 5, were affected by my inexperience and poor evaluation skills. For example the school involved in case study 1 (see paragraphs 3. 3) may have benefited by more positive interaction than I felt able to give at that time.

Other skills and techniques were acquired and utilised at a much later date. For example, the skills concerned with cross site data analysis as advocated by Miles and Huberman (1984) were used during the write-up of this thesis to assist the external validation of data. Examples of these can be seen in Tables 1 to 3. I have assembled data from the case studies into three tables to assist the analysis of the data collected from different schools and different courses and they should enable the reader to consider the effectiveness and the perceived problems of development in the key areas. Table 1 looks at the key areas of development and problems perceived, through evaluation techniques, to have affected success in schools within the case studies. For example, the evaluation reports identified the area of assessment and monitoring to be the weakest at the end of each course (Johnston 1986 p. 11; 1987 p. 22; 1988 p. 31 & 1989 p. 37) and Table 1 shows that additional influences affected development within the five schools involved in the case studies. These influences included a conflict of

ideas between headteachers and course members (see case studies 4 & 5), the school not feeling able to accommodate new ideas and the national changes in education, particularly with regards to assessment.

Table 2 attempts to identify the effectiveness of the evaluation interaction on the key areas of development in each case study school. From this table it can be seen that the evaluation interaction had overall little effect on the area of assessment whereas staff development did appear to be affected. Through this table the effect of the evaluation interaction on individual schools can also be seen. The evaluation interaction was felt to have influenced the long term development of all the key areas in case study 5, whereas little long term influence was felt to have resulted from interaction with the school in case study 4. However, it is difficult to accurately ascertain the long term impact of the D.E.S. course or the evaluator on the development of these key areas, because of the interaction of other factors which affect development. These factors are described further in paragraph 1.4 and through Figure 1 (page 13). During the evaluation interaction I experienced the effect of these factors. For example, the effect of poor relationships was clearly seen through interaction with the schools in case studies 2 and 4 and the effect of support from the headteacher seen in case study 3 and from outside agencies in case studies 1 and 5.

Table 3 considers the key areas of development within each case study, and identifies the type of evaluation interaction which was employed in order to assist development. A full description of the types of interaction are given in paragraph 4.1.6.

TABLE 1: Table grouping problems experienced in evaluating the influence on the development of key areas.

After Miles & Huberman (1984) clustered summary table.

KEY AREAS	PROBLEMS	EXAMPLE
Policy/School Science Curriculum	Limited access to data	C.S.4 Poor interaction with head
	Slow rate of development	C.S.3 Head dictated rate of change
Organisation of Practical Investigation	Non-participation on course	Evaluator not involved in course
	Conflict of roles	C.S.1 Role of evaluator not clearly defined
	Conflict of ideas	C.S.3 Head v teacher/course ideas
Organisation of Resources	Non-participation on course	Evaluator not involved in course
	Conflict of role	C.S.1 Role of evaluator not clearly defined
	Conflict of ideas	C.S.3 Head v teacher/course ideas
	Conflict of ideas	C.S.5 Head v teacher ideas
Matching	Conflict of ideas	C.S.3 Head v teacher/course ideas
	Conflict of ideas	C.S.4 Head v teacher/course ideas
Assessment/ Monitoring	Conflict of role	C.S.1 Role of evaluator not clearly defined
	Slow rate of development	C.S.2 School not ready to accommodate new ideas
	Conflict of ideas	C.S.3 Head v teacher/course ideas
	Conflict of ideas	C.S.4 Head v teacher/course ideas
Staff Development	Conflict of ideas	C.S.4 Head v teacher/course ideas

TABLE 2: Table showing effect of the interaction, in key areas of science development, in each case study.

After Miles and Huberman (1984) site-ordered summary table.

AFFECT OF THE INTERACTION IN KEY AREAS OF DEVELOPMENT

CASE STUDY	1	2	3	4	5
POLICY	good	good	none	poor	good
ORGANISATION OF INVESTIGATION	none	some	good	poor	good
ORGANISATION OF RESOURCES	none	good	none	none	good
MATCHING	none	some	none	poor	some
ASSESSMENT/ MONITORING	none	none	poor	poor	good
STAFF DEVELOPMENT	good	good	good	poor	good

TABLE 3: Table showing key areas of science development within each case study and the type of interaction employed.

After Miles and Huberman (1984) site-ordered summary table.

KEY AREAS OF DEVELOPMENT AND THE TYPE OF INTERACTION EMPLOYED DURING THE EVALUATION.

CASE STUDY	1	2	3	4	5
POLICY	positive	non-substantive	positive	positive	positive
ORGANISATION OF INVESTIGATION	positive	positive	positive	positive	positive
ORGANISATION OF RESOURCES	positive	non-substantive	positive	positive	non-substantive
MATCHING	positive	positive	positive	positive	positive
ASSESSMENT/ MONITORING	positive	positive	negative	positive	positive
STAFF DEVELOPMENT	positive	positive	positive	positive	positive

4. PART 3: INTERACTIONIST EVALUATION

In order to satisfy the evaluation needs of the D.E.S. courses and as a result of interaction with the schools involved in the courses, a qualitative model of evaluation was developed by myself as evaluator and with the support of the course leaders and course members. This model was called Interactionist Evaluation.

Like both Illuminative Evaluation (Parlett and Hamilton 1972) and Responsive Evaluation (Stake 1976) the model embodies an adaptable, qualitative general research strategy, sharing many of the characteristics of Illuminative Evaluation and embodying a degree of the flexibility of Stake's (1976) Responsive Evaluation. For example, as with Illuminative Evaluation the techniques of observation and questionnaires are used (see paragraphs 2.2 and 3.2.2), as is the use of theoretical sampling (Glaser and Strauss 1967 see paragraph 3.2.1) to choose course members for further evaluation. Discussion with participants is important in Interactionist Evaluation but discussions were not conducted as structured interviews as in Illuminative Evaluation. However, the cyclic feedback of data to assist verification is a technique used in both models and is described further in paragraph 3.2.1. With Responsive Evaluation (see paragraphs 2.4 to 2.7), Interactionist Evaluation shares a degree of fluidity which allows it to respond to the ideas and problems that occur during the evaluation and attempts to anticipate the unexpected. The most important common characteristic between the three methodologies is the recognition of, and the importance placed on, the outside influences which affect the evaluation and the course being evaluated. This is termed the "learning milieu" by Parlett and Hamilton (1972) and is portrayed in Interactionist Evaluation by Figure 1 (page 13).

We can attempt to add Interactionist Evaluation to the evaluation continuum shown in paragraph 2 and it seems appropriate that it should be positioned between Responsive and Illuminative Evaluations towards the qualitative end of the continuum.

qualitative.....quantitative

Responsive evaluation (Stake 1975 & 1976)	**Interactionist evaluation**	**Illuminative evaluation (Parlett & Hamilton 1972)**	**Pre-ordinate evaluation**

I have placed it in this position as a result of my analysis of the nature of responses involved in each type of evaluation. All three models respond in some form to those

involved in the evaluation but the difference between them is the form of that response. I believe that the responsive nature of Interactionist Evaluation requires more structure than Responsive Evaluation but less than Illuminative Evaluation. The most important difference in the response is that Interactionist Evaluation is concerned with deliberate interaction to achieve certain desired effects. This is described further in paragraph 4.1.6 and in Table 3 (see page 92).

The model which resulted from the interactions described in the case studies, whilst being very fluid in nature to accommodate on-going changes consists of two distinct elements running parallel with each other and inevitably sharing some common data. These are illustrated in Figure 1 (page 13) and involve evaluation of the quality of the course and the long term impact of the course within schools. The decision to call the evaluation Interactionist, resulted from the changes which occurred in the role of the evaluator during these evaluations. They are described through the case studies and in paragraph 3.2.3. The role became one of more active involvement, with the aims of the course and of science development in general being of primary importance. The term interaction was felt to be more appropriate for the evaluation model since it involves the evaluator in interaction with participants on the course to achieve mutually desired aims and not intervention by the evaluator to enforce previously identified changes, or a more passive type of involvement.

Interactionist Evaluation, therefore embodies characteristics and utilises techniques which have been developed and evaluated by other methodologies, but it also contains some distinct elements. It is concerned with the outcomes of the courses it is evaluating but recognises the importance of the context of the interacting variables which influence the way in which the teachers observe the world they operate in and act accordingly. It is concerned with the verification of data collected but equally important is the situation behind the data and questions such as 'Why are certain characteristics observed?' and, 'Why has there been so little or so much development ' are usual?

The importance of utilising the useful elements of both qualitative and quantitative methodologies is also recognised and I have attempted to combine the elements felt to be most useful to the situation described through the case studies (see Part 2). Whilst most of the characteristics and techniques embodied in the methodology (see paragraphs 4.1 and 4.2) are those used in qualitative evaluations, the collection and analysis of data, particularly from the questionnaires (see Appendices 3 to 6 and evaluation reports, Johnston 1986,1987,1988 & 1989 in research database), are more quantitative in nature. Louis (1982) believes that the two extremes on the continuum are growing closer, while Evans (1983) wonders if the two approaches were so very different in the first place and believes that we should be building bridges between the

two rather than creating differences. The combined use of more than one evaluation method is advocated by Benson and Michael (1987) and by McCabe (1980) who believes that such an approach ensures reliability. Brown (1975) also advocates a dual approach, stressing that there needs to be a balance between the two that does not neglect time-consuming and detailed methodology but also does not waste valuable observational resources upon methodological and technical devices. Patton (1987) suggests that more recent evaluations utilise multiple methods, but examples are difficult to find and it may be that they are more common in the USA than in Britain. Louis, (1982) describes four models of dual methodology.

1. The sequential model in which one methodology precedes the other.

2. The parallel model in which both methodologies co-exist.

3. The fused model which incorporates the most valuable features of each methodology.

4. The interactive model which is characterised by the merging of methodologies and data, the use of triangulation and cyclic interaction.

   The Interactionist method of evaluation described below has much in common with Louis's interactive model.

4.1 CHARACTERISTICS OF THE INTERACTIONIST EVALUATION MODEL

The characteristics of the Interactionist methodology were developed through interaction as described in the case studies (see Part 2) and as a result of 'rigorous' analysis of the interactions and data collected. The development process is discussed further in paragraph 1.8 and through Figure 2 (page 16). Examples of these characteristics in the data can be seen in the Research Audit in Appendix 10.

4.1.1.

The model incorporates two distinct types of evaluation looking at a) the quality of the course, that is formative in nature and b) the long term impact of the course, that is summative in nature.

4.1.2.

The evaluation is conducted in as natural a setting as possible (Burgess 1985), by visiting the course members in their school environment and by the evaluator playing a part in the course commitment. This is termed 'naturalistic evaluation' by Benson and Michael (1987) and is characterised by an attempt to capture the context in which the evaluation operates. They say that it is

"crucial to understand the contextual situation surrounding the course to be evaluated"

but also that it is important to realise that social and political forces can affect the course of events as well. In the evaluations described here (see case studies, paragraphs 3.3 to 3.7), national changes were felt to have influenced the development of science in the school in case study 4 (see paragraph 3.6.5) and case study 5 (see paragraph 3.7.3). The Open University (1979) believes that the advantage of observation within the natural context is the improvement this has on the validity of the interpretation of the data.

4.1.3.

The evaluation depends to a very large extent on building up relationships and interacting with the people involved in the course to establish trust and confidence with the course members, course leaders, headteachers and staff (Measor 1985, Denscombe 1983 & Hitchcock 1983). As Benson and Michael (1987) say, it is impossible to separate the course and the effect relationships have on it because their interaction is simultaneous. Shared interests and values help in this relationship building. It is also an important characteristic of the interactionist model that the evaluation is conducted by another teacher with the same day to day classroom problems, but with evaluation skills. This is similar to the collaborative evaluation described by Bell (1990) and Vulliamy, Lewin and Stephens (1990).

4.1.4.

The evaluator decides which evaluation path to take as in Responsive Evaluation (Stake 1976), depending upon the characteristics of each individual course. Certain previously identified key issues may be explored but the evaluator negotiates with course members and leaders as to which issues are important to each group. These may not involve all those issues previously identified but may include other unforeseen ones.

4.1.5.

The evaluation involves a deal of flexibility (Burgess 1985) to allow the research path and techniques to be modified as necessary whilst each course is running. The

modification of methods during research was also found to be necessary by Porter (1984) in her research into higher education. This flexibility takes into account the belief (Walker 1990) that schools, as with all social processes, are not rigid in structure and are liable to change.

4.1.6.

The evaluator has an active role within the course (termed interventionist by Stake 1976) and therefore affects the outcomes deliberately in order to facilitate necessary modifications. The basis for questioning existing practices will justify possible controversy and the resources spent on it. The interactionist role is supported in part by Benson and Michael (1987) through their belief that it is impossible to separate the researcher from what is being researched. Porter (1984) in her research into higher education included some deliberate input which was designed to change aspects of the area which she was researching.

> "I was perhaps altering the course of events but there was a commitment to the students which would not allow total detachment from their interests"
>
> (Porter 1984, p.158).

It is this characteristic that sets Interactionist Evaluation apart from other evaluations such as Illuminative and Responsive Evaluations. Illuminative and Responsive Evaluations appear to accept the criticism that evaluator involvement has some effect on the data collected. However they regard the subsequent value of the data collected in this way to justify the criticism.

Interactionist Evaluation also accepts that the evaluator will affect the data but rather than regarding it as a negative result of the evaluation, it attempts to use that effect in a positive way by deliberate involvement where necessary in order to achieve certain desired effects and to facilitate successful outcomes. The term interaction has been carefully chosen because the evaluation relies on the development of successful relationships and resulting interaction and not intervention. The evaluation therefore accepts commitment to the aims of the course it is evaluating and interaction occurs to ensure that they are met to the mutual satisfaction of all concerned. Interactionist Evaluation recognises three distinct modes of interaction.

a) positive interaction, whereby positive support and interaction encourages those concerned in their development, which Bell's (1990) collaborative evaluation goes someway to endorse. Positive interaction occurs to encourage and support developments which are either already on-going or are felt to be a natural progression from the present situation. There are examples of positive interaction within the evaluations described in the case studies (see Part 2) and in Table 3 (see page 92) where

the effect of different types of interaction on the key areas of science development can be seen. In case study 1 (see paragraph 3.3.4) I supported and encouraged general developments within the school, in case study 3 (see paragraphs 3.5.5 - 3.5.6) I supported and encouraged the course member in the development of a school science policy and in case study 5 (paragraph 3.7.6), I gave positive feedback to the headteacher regarding my thoughts on the school's progress.

b) negative interaction, whereby the evaluator interacts to convince those concerned against a course of action. This will often encourage others towards a more positive form of action and subsequently assist the achievement of the negotiated aims of the evaluation and the course being evaluated. This usually occurs because it is felt by the evaluator and others involved in the evaluation that an action will have a negative impact on development and will hinder fulfilment of the aims of the course. Within the case studies I have identified two examples of negative interaction. In case study 2 (see paragraph 3.4.3) I attempted to change the headteacher's attitude to science and in case study 3 (see paragraphs 3.5.5 - 3.5.6) I attempted to change the headteacher's plans regarding assessment and monitoring.

c) non substantive interaction involves two quite different interactions. The first involves the evaluator in deliberately not interacting. This type of interaction is either used when it is felt that no positive outcome will result from either positive or negative interaction. I have identified two examples of this type of non substantive interaction from within the case studies (see Part 2). In case study 2 I decided not to discuss the details of the school science policy being developed by the course member (see paragraph 3.4.6) because I felt that the policy was unlikely to be of use in an unsupportive environment. This was a deliberate decision not to involve myself in this area of development. In case study 5 (see paragraphs 3.7.3 - 3.7.6) I deliberately did not enter into the debate between the headteacher and course member regarding resources. I did however attempt to discover the nature of their disagreement in more detail and in doing so possibly involved myself in the other type of non substantive interaction. This type does not involve a deliberate action or non action but involves affecting developments without any substantive interaction. In this way it demonstrates the power of non substantive interaction on events being examined. It recognises that interaction is a continuous process and can unwittingly affect developments. An example of this type of interaction was described in case study 2 (see paragraph 3.4.6) when as evaluator I positively affected the key area of resources without deliberate action on my part.

4.1.7.

During the evaluation, data is collected and analysed simultaneously (Burgess 1985). As with Responsive Evaluation (Stake 1976) data is not collected to refute or support hypotheses, but rather a theory emerges from the data as it is collected and modified subsequently if necessary. This idea that theory should be discovered from data (termed grounded theory) and not as a result of rigorous testing of facts is developed further by Glaser and Strauss (1967) and is discussed in paragraphs 1.8 and 3.2.1. They believe that there is an over emphasis on discovering which concepts and hypotheses are relevant for the area being researched.

Care, however is taken to ensure that the exploration and formulation of theoretical ideas do not hinder verification. In this way evaluation encompassing grounded theory should be free of the criticisms that data collected could have alternative explanations (Brown 1973).

4.2 TECHNIQUES USED DURING THE EVALUATION.

During the evaluations described in the case studies (see paragraphs 3.3 to 3.7) a number of evaluation techniques were used which became incorporated into Interactionist Evaluation methodology. These are described fully below and examples of their use in the case studies can be found in the Research Audit in Appendix 10.

4.2.1.

Observation plays a very large part in the evaluation as with 'Illuminative Evaluation' (Parlett and Hamilton 1972). During any evaluation interaction observations are being made and can be of immense value in analysing data. Within the case studies described in paragraphs 3.3 to 3.7 observations were noted in the school visit notebooks. These notebooks (see Appendices 8a and 8b) note observations within pre-determined categories, for example key areas of development and individual members of staff. Examples of observations made in the case studies can be found in Appendix 10. However, observation alone is limited in its usefulness unless the evaluator has access at all appropriate times and unless the assigned meanings to observed phenomena can be easily verified, because as Denscombe (1983) says, we cannot be certain that the evaluator has not influenced what is observed nor has been influenced by it. As a result it is necessary to consider observation alongside other evaluation techniques.

4.2.2.

Discussions using key informants (Burgess 1985a) is another important technique. Qualitative research relies upon individual informants for its data and they may be representatives of broader groups that are to be studied, chosen at random or specially selected by the evaluator or indeed put forward by themselves. In this evaluation the informants are mainly chosen using theoretical sampling outlined by Glaser and Strauss (1967) and discussed in paragraph 3.2.1. This is a process whereby data is collected, coded and analysed jointly and then the decision as to what data to collect next is made in order to develop a theory as it emerges. Denscombe (1983) feels that combined with observation this method has a distinct advantage over other observational techniques, which however rigorously conducted may be influenced by the evaluator and provide observations which are difficult to verify. In this case theoretical sampling means seeking out course members who may be able to enlarge upon certain viewpoints connected with for example, different types of school environment or different types of prior expertise in the field of primary science teaching. Denscombe (1983) feels that this will provide more data/background information in the desired areas and provide the hard data required for objectivity.

As described in paragraph 3.2.2, these discussions take place at the start of the course and involve the elicitation of the course members' expectations of the course as compared with the course leader's aims and are combined with some discussion of their school situation and problems that they may have. Subsequent discussions take place during and after the duration of the course and these expectations and their achievement can be investigated.

Comparisons such as this have been successfully used previously (McCabe,1980) to evaluate in-service teacher training. The success of these discussions is assisted by the fact that they take place at mutually convenient times which Denscombe (1983) believes to assist not only data collection but the quality of the data collected because it relies upon the co-operation of the respondents. This normally means that the discussions take place in the course members' schools, where most of the issues discussed can also be observed therefore assisting verification.

The discussions have some structure but are basically fluid in nature to ensure that the required areas are covered but not to restrict 'informants' who may uncover new lines of enquiry (Measor 1985). Measor believes that to allow 'rambling' is important because areas are being moved into which are of importance and interest to the informant and that this may open up new areas for investigation.

Biott (1981) is concerned that manipulation by informants may occur and that views may be aired with specific intentions or outcomes in mind. However it is also quite possible that evaluators may recognise areas neglected, missed or ignored because of

their own values and opinions, and so it is important to provide an opportunity for the informant to put forward their version of events which may have been viewed in a different context by the evaluator.

The data acquired in this way makes up for the loss of control during the interview situation. This type of discussion termed 'informant interviewing' by Powney and Watts (1987) is felt to gain an insight into the perceptions of the person being interviewed.

Graded questions (Measor 1985) can be usefully employed so that sensitive questions can be added after informants are relaxed and happily giving information. At all times flexibility of approach is required to ensure that the different variables affecting each discussion are taken into account and a successful interview is obtained. Such factors will not only include the informant's school situation, status, expectations etc. (see Figure 1 page 13 Model of Evaluation, which identifies the variables affecting evaluation), but also the relationship between the respondent and the evaluator, and all of these will affect the responses made (Denscombe 1983). Douglas (1976) believes that many of these factors reflect conflicts of interest between the parties concerned and Huberman and Crandall (1982) use Douglas' (1976) techniques of investigative social research which embody these beliefs together with Glaser and Strauss' grounded theory to produce a

"powerful investigative mix" (page 69)

which involves rigorous data collection but allows for the factors underpining the data. A sensitive interview style should be developed that should adapt to the needs of the informants, adding structure where necessary and allowing areas not previously considered to be developed. In this way all areas requiring answers and some unthought of ones should be adequately covered enabling the evaluator to have sufficient data which can be verified by other means. Within the evaluation described through the case studies (see paragraghs 3.3 to 3.7) areas for discussion were pre-determined but questions were not asked until respondents were at ease and discussing freely. This sometimes meant that other discussion areas, not specified, were entered into but this this often led to unexpected data and benefited the evaluation. Questions were asked when full information was not obtained through the discussion, when repondents were at ease and sensitive questions were required and when verification of data was required. In this way Measor's (1985) idea of graded questions was incorporated into the evaluation methodology.

Good interviewing involves the informants as active participants, negotiating with the evaluator for the information that they provide. Involving course members is felt by Biott (1981) to lead to a more positive attitude towards the evaluation. This

participation can be assisted by the use of critical listening (Measor 1985) during discussions, that is involving course members in examining their own responses. The use of triangulation both in and between schools (Louis 1982 and Huberman and Crandall 1982) is also of great use. This involves looking at the data from the viewpoints of others and discussing the data with others from within one school or from other schools. This can also aid verification of the data and hopefully ensure that the evaluator is not being manipulated by 'informants' or ignoring relevant data. Triangulation is discussed more fully in paragraph 1.3.1.

Examples of the use of triangulation within the case studies can be found in the Research Audit in Appendix 10. They include the example from case study 5 when I verified the difference of opinion between the course member and the headteacher on the issue of resources (see paragraph 3.7.2), and the example of triangulation between schools which occurred as a result of interaction with the school in case study 1, when the idea that the course lacked relevance to Infant schools was raised (see paragraph 3.3.4)

4.2.3.

Further enquiry to explain observations, including;

a) group discussions which are often of limited value because they do not provide results which are representative of a group as a whole. However they do provide a valuable opportunity for observing group members and as Powney and Watts (1987) suggest a range of experience and attitudes can be thus noted.

They can also provide a valuable occasion to verify theories with respondents by monitoring their responses to a general set of ideas. The involvement of others in this way is advocated by Walker (1983) and felt by Biott (1981) to lead to a more positive attitude towards the usefulness of the evaluation, which should in turn affect the quality of the data received.

Within the evaluations described in the case studies (see Part 2), group discussions occurred at the end of each phase of the course and on such occasions the evaluator can be very much in control of the discussions and the semi-structured format is much more like respondent interviewing as outlined by Powney and Watts (1987).

On other occasions, for example local education authority support group discussions involved the evaluator as an observer (see 4/84 evaluation report Johnston 1985 page 15).

b) questionnaires to verify data acquired. These give valuable overall pictures of the pattern of responses which when compared with other data can formalise already developing ideas or show new avenues that require exploration. Examples of the

questionnaires used during the evaluations described in the case studies (see Part 2) can be seen in Appendices 3 - 6.

c) in depth interviews/discussions (Measor 1985) which will help to verify data, by discussing ideas/theories already developing and may as Biott (1981) has found raise new issues. This does raise problems that the course of events are being altered but the idea of asking advice and opinions from those being studied is not new (see Porter 1984) and has been found to be beneficial. Stake (1976) believed that active intervention is necessary in order to acquire additional information. This model whilst accepting the value of intervention believes that the data acquired and the benefits to the clients from interaction is far greater than that acquired through intervention. In depth interviews occurred during each school visit with course members and headteachers and these are described within the case studies and in the school visits notebooks (see research database). Extracts from the school visits notebooks can be seen in Appendix 8.

d) discussion documents/written accounts by course members on certain themes. Again these will help in the verification of data collected via observation. During the evaluation described here, course members provided me with data on their school policies and other discussion documents. This data is described in the case studies (see paragraphs 3.3 to 3.7) and examples from case study 3 are shown in Appendix 7.

4.3 FACTORS AFFECTING THE COLLECTION OF DATA IN TERMS OF BOTH TYPE AND QUALITY.

4.3.1. The evaluator

The evaluator will affect the data collected in many ways. Personality, age, sex, education, socio-economic status, race, religion, psychological factors such as perceptions, attitudes, expectations and motives and behavioural factors such as appearance and conduct will effect the way that he not only interprets data but his relationships with others e.g. course members, course leaders, informants, school staff etc. Measor (1985) believes that if the evaluator's appearance does not fit into the group and his behaviour does not relate to the varied individuals involved with the evaluation then data collection becomes very difficult.

Also of importance is the status of the evaluator both perceived and actual. Actual status will affect not only the evaluator's perceptions of himself and therefore his

performance but also the perceptions of those he is working with and subsequently their response. Powney and Watts (1987) indicate that there may be advantages from low or equal status in the eyes of the informants, because they may be more likely to disclose information. Ball (1983) identifies two questions that evaluators should ask themselves, the answers to which could affect the quality of collected data.

Is the evaluator's status accepted by informants or has it been imposed upon them?

Once the role of the evaluator is established within a group, can it be maintained?

My dual role as classroom teacher and evaluator as discussed earlier in paragraph 3.2.3 had the advantage in that I was able to freely discuss issues with course members on an equal footing. However, the role of evaluator was perceived in a different way by some involved in the evaluation for example, the headteacher in case study 2 (see paragraph 3.4.3 & 1/86 school visits notebook in research database) who felt pressurised by his perception of my role into allocating £700 for science resources.

The resulting dangers of a poorly established or perceived role, that is defence mechanisms, evasion tactics or manipulation cannot be ignored. It is thought (Smetherham 1978) that these may occur during participant observation and so will be increasingly likely with a more open evaluation approach.

Other characteristics such as style and bias, in turn affected by the numerous variables already mentioned, may also influence the data collected. These interests, theories, problems and biases, termed strategic relevances by Ball (1983), may be imposed on the evaluation and influence the evaluator in the collection and analysis of data. Such interests and biases need to be made explicit, although it may be that the evaluator is either unaware of, ignores or denies them. I am convinced that my own desires to promote good science developments influenced those involved with me in the evaluation described here. I would hope that any influences would be positive and encourage the development of science, but I am also aware that on some occasions my influence was not effective. For example I was unable to influence the headteacher in case study 3 to consider the development of assessment and monitoring (see paragraphs 3.5.5 -3.5.6 & 3/85 school visits notebook in research database).

Powney and Watts (1987) are very concerned by the large number of untrained and inexperienced educational researchers, who may not appreciate the difference between a probe and a prompt, or know when best to keep silent. Despite the desirability of using skilled evaluators, I suspect that many evaluators develop their skills in a similar way to me, embarking on the work before analysing and developing the skills required.

4.3.2. Relationships.

Conducting evaluations involving discussions and interviews is as complex as any other social interaction. It is widely felt (Denscombe 1983, Hitchcock 1983, Measor 1984, Benson and Michael 1987) that useful data will be lost without a relationship built on mutual trust and confidence. Shared interests and values help, but can not be invented. In this way the importance of a fellow teacher able to collaborate in planned change is stressed (Bell 1990 and Villiamy, Lewin & Stephens 1990) and my dual role becomes valuable.

Problems in building a relationship may occur because of the evaluator's personality, style, status, etc. as discussed previously. They are also felt to occur because of the status of the evaluator compared to the informant (Porter 1984), for example when interviewing peers or superiors, and it is necessary to ask awkward or pertinent questions, or when they are asked of the evaluator. The absence of consent for the evaluation to take place will cause problems, for without consent data collection is difficult at its best. Even where consent for evaluations are built into courses it is still necessary to negotiate not only consent but support from all concerned to enable good working relationships to be established and to allow for useful collection of data.

The personalities of other people involved in the course will determine the successful building up of relationships amongst the course members and with the course leaders. These personalities are affected by the same factors influencing the personality of the evaluator (see paragraph 4.3.1).

These relationships in turn will affect the geo-political distribution of groups within the course members studied, for example, where do they sit and who with and what cliques are developing? (Ball 1983). The existence of such cliques can seriously affect data collection and its validity.

4.3.3. The school situation.

The school context, the influences, philosophies and position of the school, called institutional geo-politics by Ball (1983) may affect data collection. For example schools within different areas, authorities etc., may have very different constraints upon them and this will affect the evaluation. The school catchment area, the age, socio-economic and ethnic backgrounds of the children and staff, their personalities, experiences, relationships, cliques etc. will all affect the way in which they perceive the evaluator and the evaluation and may subsequently affect the data collected. As discussed in paragraph 3.2 the schools described in the case studies (see Part 2) came from two local education authorities, with different structures and support systems, as

well as from different schools, with distinctly different teaching environments. The effect of the school environment could be seen in case study 4 (see paragraph 3.6.5 & 3/85 school visits notebook in research database) when changes in staff affected the long term impact of the course. Another example of the effect of the local environment can be seen through case study 2 (see paragraph 3.4.1 & 1/86 school visits notebook in research database) when the headteacher acknowledged that he wished his school to be involved in the course because of the Infant school's scientific development.

The school situation will also determine to a large extent the access that the evaluator has to the informant. Measor (1985) and Ball (1983) stressed that access to informants to allow time to build up relationships was important. This access, when during school time should be without the responsibility of the class or interruptions such as telephone calls. I experienced difficulties of access on a number of occasions. The difficulties associated with the headteacher in case study 2 are well documented (see paragraph 3.4.3 & 1/86 school visits notebook in research database) but I also experienced difficulties in other schools which are not described in this thesis. For example during a school visit for the 9/87 course (see 9/87 school visit notebook in research database) a course member identified difficulties with her headteacher as she could not

"discuss with him as he is rarely in school and when he is, is easily distracted"

(9/87 school visits notebook in research database).

I wrote in the school visit notebook at that time that this

"was apparent when talking to him"

(9/87 school visits notebook in research database).

because he kept leaving the room to talk to people or to make telephone calls.

Access may also be restricted because of poor timing. The collection of data at Christmas or on a Friday afternoon will obviously be less successful than more carefully timed collection. As Ball (1983) has said

"Time is a factor in the determination of meaning and perceptions."

4.3.4. Data collection.

The method of collecting data can affect the quality of the data in a significant way. At the start of the evaluation described in this thesis I carefully considered the different methods and chose not to use any overt method. Different methods of collecting data are set out and discussed in paragraph 3.2.2 where the decision to use school visits notebook is justified.

5. SUMMARY.

5.1 The Interactionist model.

The Interactionist model of evaluation has been developed utilising, where relevant, characteristics and techniques from other evaluations, which in some cases have been modified to suit the evaluation being conducted. The emerging model has very much its own identity being the result of interaction with others (see case studies paragraphs. 3.3 - 3.7). However it also incorporates existing ideas whose successful implementation in other evaluations justify their use.

It is hoped that the model is flexible enough to adapt to suit any situation and the changing face of in-service science education for which it was developed. It is this flexibility along with the importance that it places on interaction with its clients to achieve mutually desired aims and the use of the same clients in verification procedures, that identify Interactionist Evaluation as being different in the field of educational evaluation.

5.2 Modifications to the evaluation study.

The flexibility of the model of evaluation does create some problems. In the evaluations described in this thesis, the major problem has been the constantly changing evaluation role which evolved into the Interactionist model over a long period of time. This has created difficulties in validating data. A stable role, which is able to adapt to minor change is desirable as opposed to a role that changes radically over a period of time. I would not however wish to see a stagnant role which could not adapt to changes in the courses and the evaluation.

The skills of good evaluation are ones that require some development, preferably before the start of an evaluation. I suspect that this study is not exceptional in that the evaluator learnt many of these skills during the evaluation but I acknowledge the desirability of a skilled evaluator where possible to maximise developments.

5.3 Further developments.

Disillusionment with traditional methods of course evaluation has fuelled the search for suitable alternative methods. My role within The Nottingham Trent University has changed since the start of this research from an outside evaluator to a member of the course team and onto the course leader for science in-service courses such as those described here. The role of evaluator has also changed alongside this, in that an outside evaluator has not been employed on the courses for some time. I have mixed feelings about this development but I am aware of the skills the course team have developed which now enable them to undertake their own evaluations and in many ways make such an appointment unnecessary.

This research has led me to consider how an Interactionist model can assist the evaluation of all courses on which I teach. My main concern has always been, not only the students' perceptions, but the context in which they form those perceptions. The factors influencing teachers' development on science In-service courses are set out in Figure 1 (page 13), but students on any course will be affected by a whole range of factors. On Initial Training courses I was aware that we often summatively evaluated our courses, without consideration of the influences on the students, such as exams, weather and teaching practice. On one occasion I returned assignments to students at the start of the final science session and then later asked them to evaluate the course! The resulting evaluations told me a great deal about their feelings concerning their assignments, my marking and more importantly their grade, but did little to inform me of the quality of my teaching or their learning.

During the last two years I have expanded and adapted the Interactionist model to encompass additional techniques which I consider may accurately portray the students perceptions of courses. In particular, I have trialled the use of formative evaluation diaries, similar to Parlett and Hamilton's (1972) work diaries (see paragraph 2.2.5), in which students can anonymously comment on any session. I have found that these diaries give immediate feedback on problems which can be tackled as soon as they arise and modifications made to the course if necessary. The trials have indicated that this method of evaluation has been successful and students have encouraged other colleagues to utilise the methodology in their own teaching. The result is that all members of the science team have been using dairies to assist in the evaluation of their teaching. More recently I have used evaluation diaries with two, twenty day primary science courses. I found them to be of great use in informing me of the various aspects of the course that they enjoyed or were unhappy with. However I found them less useful in giving me data on the perceived learning that had taken place. Having reached the final day of one twenty day course I asked the course members to evaluate

the course in terms of their own development in science and the immediate and long term impact for their school. In looking at the resulting comments, I felt that the teachers found it difficult to analyse their own learning and preferred to focus on the quality of teaching, rather than the quality of learning. I subsequently introduced a new element to the evaluation and at the end of the second twenty day course a week later I asked the course members to interview each other and to elicit their perceptions on their learning and on school developments. The results were significantly more informative and I intend to look closer at these strategies in the future.

6. BIBLIOGRAPHY

6.1 References

ADELMAN C. & ALEXANDER R.J. (1982) "The Self Evaluating Institution: Practice and Principles in the Management of Educational Change." Methuen.

ADELMAN C., JENKINS D., & KEMMIS S. (1976) "Rethinking Case Study: Notes from the 2nd Cambridge Conference." in SIMONS H. (ed) (1980) "Towards the Science of the Singular". Centre for Applied Research in Education. Occasional Paper Publication No.10.

ASSESSMENT OF PERFORMANCE UNIT (1978) "Science Progress Report (1977)-1978."

ASSESSMENT OF PERFORMANCE UNIT (1981) "Science in Schools" D.E.S.

ASSESSMENT OF PERFORMANCE UNIT (1983) "Science at age 11: Report for teachers :1" D.E.S.

ASSESSMENT OF PERFORMANCE UNIT (1986) "Planning Scientific Investigations at age 11: Science Report for Teachers: 8 D.E.S.

ASSOCIATION FOR SCIENCE EDUCATION (1989) (unpublished) "The Report of the Education Conference Nottingham April 1989: Building Continuity and Progression into the Science Curriculum." A.S.E.

ASSOCIATION FOR SCIENCE EDUCATION (1989a) "The National Curriculum: Making it Work for the Primary School". A.S.E.,A.T.M.,M.A.,N.A.T.E.

BALL S.J (1983) "Case Study Research in Education: Some notes and problems." in HAMMERSLEY M. (ed) (1983) "The Ethnography of Schooling." Bemrose Press Ltd.,

BASSEY M. (1986) "Does Action Research Require Sophisticated Research Methods." in HUSTLER D., CASSIDY T. & CUFF T. "Action Research in Classrooms and Schools." Allen & Unwin.

BELL G.H. (1990) "Collaborative Consultant Through Action Inquiry." in AUBERY C. (1990) "Collaborative Consultancy."

BENSON J. & MICHAEL W.B. (1987) "Designing Evaluation Studies: A 20 year perspective" in International Journal of Educational Research Vol.11 No.1 1987 pp 43-56.

BIOTT C. (1981) "Evaluation, Researcher, Participant: Role Boundaries in a Long Term Study of Innovation." in SMETHERHAM D. (ed) (1981) "Practising Evaluation." Nafferton Books.

BRACHT G.H. & GLASS G.V. (1968) "The External Validity of Experiments." in HAMMERSLEY M. (1979) "Analysing Ethnographic Data." O.U. 304 Open University Press.

BRIERLEY M.C. (1989) "An Evaluation of Primary School. Science INSET in Tyneside - January - July 1989." Univ. of Newcastle-upon-Tyne, School of Education. Diploma in Advanced Educational Studies.

BROWN G.W. (1973) "Some Thoughts on Grounded Theory." in SOCIOLOGY Vol. 7. No.1 pp 1-6.

BURGESS R.G. (ed) (1985) "Strategies of Educational Research: Qualitative Methods." Social Research & Educational Studies Series 1. The Falmer Press.

BURGESS R.G. (ed) (1985a) "In the Company of Teachers: Key Informants and the Study of a Comprehensive School." in BURGESS (1985) IBID.

CRAIG J. & FISHER P. (1987) (unpublished) "E.S.G. Primary Science - Leicestershire".

CROSSLEY M. & VULLIAMY G. (1984) "Case Study Research and Comparative Education." in COMPARATIVE EDUCATION Vol.20 No.2. pp193-207.

DENSCOMBE M. (1983) "Interviews, Accounts & Ethnographic Research on Teachers." in HAMMERSLEY M. (ed) (1983) OP. CIT.

D.E.S. (1967) "Children and their Primary Schools: A report of the Central Advisory Council for Education (England)." Vol.1. H.M.S.O.

D.E.S. (1978) "Primary Education in England". London. H.M.S.O.

D.E.S. (1985) "Science 5-16: A Statement of Policy". H.M.S.O.

D.E.S (1987) "D.E.S. Circular 9/87"

D.E.S (1988) The Education Reform Act. H.M.S.O.

D.E.S (1988a) "National Curriculum. Science for ages 5 to 16. Proposals of the Secretary of State for Education and Science and the Secretary of State for Wales." H.M.S.O.

D.E.S (1989) "Science in the National Curriculum." H.M.S.O.

D.E.S (1989a) (unpublished). Letters to Chief Education Officers and H.E. Institutions." May 1989 & July 1989 LEATGS 1990/91

D.E.S (1989b) "The Implementation of the National Curriculum in Primary Schools." A report by HM Inspectors carried out Summer 1989.

D.E.S (1989c) "HMI Discussion Paper. Draft Framework for Inset Courses for Primary Teachers in Science and the National Curriculum." April 1989.

D.E.S (1991) "Implementation of the Curricular Requirements of the Education Reform Act - Science Key Stages 1 and 3: A Report by H.M. Inspectorate on the First Year" H.M.S.O.

D.E.S (1992) "Designated Courses in Mathematics and Science for Primary Teachers - A Report by H.M.I.". D.E.S.

DOUGLAS J. (1976) " Investigative Social Research". Beverley Hills CA. Sage.

EVANS J. (1983) "Criteria of Validity in Social Research: Exploring the Relationship between Ethnographic & Quantitative approaches?" in HAMMERSLEY M. (ed) (1983) OP. CIT.

EVANS N. (1981) "National Foundation for Educational Research."

FITZ-GIBBON C.T. & MORRIS L.L. (1987) How to Design a Program Evaluation Sage

FROST J. & TURNER S. (1987) "Reflections on D.E.S. Courses for Science Co-ordinator in Primary Schools." in PRIMARY SCIENCE REVIEW. No.5 Autumn 1987.

GILBERT C. & MATTHEWS P. (1981) "LOOK! Primary Science: Teacher's Guide B." Addison-Wesley Ltd.

GILBERT C. & MATTHEWS P. (1984) "A Guide to Primary Science Policy". Edinburgh. Oliver and Boyd.

GLASER B. &. STRAUSS A. (1967) " The Discovery of Grounded Theory." New York Aldine.

GUEST A.G. (1985) "Teacher Fellowship - Final Report." Trent Polytechnic & Lincolnshire Education Authority.

HARLAND J. & KINDER K. (1992) "Mathematics and Science Courses for Primary Teachers: lessons for the future. A report for the D.E.S. N.F.E.R.

HARLEN W. (ed) (1977) "Raising Questions" & "Finding Answers" Oliver & Boyd.

HARLEN W. (1985) "Primary Science, Taking the Plunge - How to teach Primary Science more Effectively". Heinemann Educational.

HARLEN W. (1985a) "Teaching and Learning Primary Science." Paul Chapman.

HENERSON M., MORRIS L.L. & FITZ-GIBBON C.T. (1987) How to Measure Attitudes. Sage.

H. M. INSPECTORATE (1989) (unpublished) "Draft Framework of Inset Courses for Primary Teachers in Science and the National Curriculum: a discussion paper."

HITCHCOCK G. (1983) "Fieldwork as Practical Activity: Reflections on Fieldwork and the Social Organisation of an Urban Open-Plan Primary School." in HAMMERSLEY M. (ed) (1983) "The Ethnography of Schooling" Bemrose Press Ltd.,

HUBERMAN A.M. & CRANDALL D.P. (1982) "Fitting Words to Numbers" in AMERICAN BEHAVIOURAL SCIENTIST Vol.26 No.1. Sept/Oct 1982.

JOHNSTON J.S. (1986) (unpublished) "D.E.S. 4/84 Primary Science Consultants' Course - Evaluation." Nottingham Polytechnic.

JOHNSTON J.S. (1987) (unpublished) "D.E.S. 3/85 Primary Science Consultants' Course - Evaluation." Nottingham Polytechnic.

JOHNSTON J.S. (1988) (unpublished) "D.E.S. 1/86 Primary Science Consultants' Course - Evaluation." Nottingham Polytechnic.

JOHNSTON J.S. (1989) (unpublished) "D.E.S. 9/87 Primary Science Consultants' Course - Evaluation." Nottingham Polytechnic.

KEMMIS S. & ROWBOTTOM I. (1981) "Principles of Procedure in Curriculum Evaluation. in JOURNAL OF CURRICULUM STUDIES Vol.13 No.2.

KERR J. & ENGEL E. (1980) "Should Science be taught in Primary Schools?" in EDUCATION 3-13 Vol.8. No.1.

LOUIS K.S. (1982) "Multisite/Multimedia Studies." in AMERICAN BEHAVIOURAL SCIENTIST Vol.26 No.1. Sep/Oct 1982.

McCABE C. (1980) "Evaluating In-service Training for Teachers." N.F.E.R.

MACDONALD B. (1974) "Evaluation and the Control of Education/" in SCHOOLS COUNCIL RESEARCH STUDIES "Curriculum Evaluation: The State of the Art."

MACDONALD B. & WALKER R. (1975) "Case Study and the Social Philosophy of Education." in CAMBRIDGE JOURNAL OF EDUCATION Vol.5 No.2 pp 2-11.

MEASOR L. (1985) "Interviewing: a strategy in qualitative research." in BURGESS R.G. (ed) 1985) OP. CIT.

MILES M.B. & HUBERMAN A.M. (1984) "Qualitative Data Analysis. A Source Book of New Methods." Sage.

NOTTINGHAM UNIVERSITY (1983) (unpublished). Evaluation of Course, D.E.S. 151. "Developing Science in the Primary School" March 1983.

NUFFIELD FOUNDATION (1964-1966) "Junior Science Project".

ORMEROD M.B. & DUCKWORTH D.
(1975) "Pupils Attitudes to Science - a review of research." NFER.

O.P.E.N.S. (1990) (unpublished) "Papers relating to open-ended science work". Open ended science project, Centre for Educational Studies, Kings College, London.

OPEN UNIVERSITY (1972) "Sorting Them Out: Two Essays on Social Deprivation". O.U. Press.

OPEN UNIVERSITY (1979) "Research Methods in Education and the Social Sciences." O.U. Press.

PARLETT M. & HAMILTON D. (1972) "Evaluation as Illumination: A New Approach to the Study of Innovatory Programmes." Occasional Paper No. 9 Centre for Research in Educational Sciences. Univ. of Edin.

PARLETT M. (1980) "Training for Case Study Research and Evaluation." in SIMONS H. (ed) (1980) "Towards a Science of the Singular" Centre for Applied Research in Education. Occasional Paper Publication No. 10.

PARKER S. & WARD A. (1977-1979) "Sciencewise". Nelson.

PATTON M.Q. (1987) "How to Use Qualitative Methods in Evaluation"

PHIPPS R. & CHURCHER J. (1988) "There has to be Science in your Central Theme." in PRIMARY SCIENCE REVIEW No. 6 Spring 1988.

PLIMMER D. (1981) "Science in the Primary schools: What went wrong?" in SCHOOLS SCIENCE REVIEW. Vol. 62 No. 221.

PORTER M. (1984) "The Modification of Method in Researching Postgraduate Education." in BURGESS R.G. (ED) (1984) OP.CIT.

POWNEY J. & WATTS M. (1987) "Interviewing in Educational Research." Routledge & Kegan Paul.

PURKEY W.W. (1970) "Self-Concept and School Achievement". Prentice Hall.

SCHOOLS COUNCIL (1967-1974) "Science 5/13 Project" MacDonald Educational.

SCHOOLS COUNCIL (1983) "Primary Practice." Methuen Educ.

S.E.A.C. (1989) "A Guide to Teacher Assessment.
Pack A. Teacher Assessment in the Classroom.
Pack B. Teacher Assessment in the School.
Pack C. A Source Book of Teacher Assessment. Heinemann Educational.

SCIENCE HAPPENINGS (1969). Ginn.

SCIENCE HORIZONS (1981-1986) "West Sussex Science 5-14 scheme". Globe, Macmillan Educational.

SHERRING P. (1989) "Developing a Science Policy as part of on-going curriculum development". in PRIMARY SCIENCE REVIEW. No. 11 Autumn 1989.

SMETHERHAM D. (SCHOOLS COUNCIL) (1978) "Insider Research." in BRITISH EDUCATION RESEARCH JOURNAL Vol. 4 No.2.

STAKE R.E. (1975) "Evaluating the Arts in education: A responsive approach." Colombus Ohio Merill.

STAKE. R.E. (1976) "Programme Evaluation, particularly responsive evaluation." in DOCKRELL W.B. (ed) (1980) "Rethinking Educational Research." London Hodder & Stoughton.

STECHER B.M. & DAVIS W.A. (1987) "How to Focus an Evaluation". Sage.

STENHOUSE L. (1975) "An Introduction to Curriculum Research and Development." Heinmann London.

STENHOUSE L. (1979) "Case Study in Comparative Education: particularity and generalisation." in COMPARATIVE EDUCATION Vol. 15 No.1 pp 5-10.

WALKER R. (1980) "Making Sense and Losing Meaning: Problems of Selection in doing Case Study". in SIMONS H. (ed) (1980) "Towards a Science of the Singular" Centre for Applied Research in Education. Occasional Paper Publication No.10.

WALKER R. (1983) "Three Good Reasons for not doing Case Studies in Curriculum Research." in JOURNAL OF CURRICULUM STUDIES. Vol. 15 No.2. pp 155-165.

WALKER R. (1985) "Doing Research: A Handbook for Teachers." Metheun.

WEDGE P. & PROSSER H. (1973) "Born to Fail". Arrow.

VULLIAMY G., LLEWIN K., & STEPHENS D. (1990) "Doing Educational Research in Developing Countries." Falmer Press.

YIN R.K. (1984)
"Case study Research, Design and Methods." Applied Social Research Methods Series Vol.5 Sage.

6.2 Additional Reading

ARGYLE M. (1969) "Social Interaction." Methuen.

BELL G.H. (1985) "Can Schools develop knowledge of their practice?" in SCHOOL ORGANIZATION Vol.5 No. 2. pp 175-184.

BURGESS R.G. (ed) (1984) "The Research Process in Educational Settings: 10 case studies." The Falmer Press.

C.N.N.A. (1975) "Partnership in Validation." London C.N.A.A.

C.N.A.A. (1979) "Developments in Partnership in Validation." London C.N.A.A.

D.E.S (1989d) "L.E.A. Training Grants Scheme: Monitoring and Evaluation." D.E.S.

D.E.S (1991) "Evaluation of Designated Courses in Maths. and Science for Primary Teachers". Letter to all Chief Education Officers and Designated Course Providers.

HAMILTON D., JENKINS D., KING C., MACDONALD B. & PARLETT M. (eds) (1977) "Beyond the Numbers Game." Macmillan Education Ltd.

HAMMERSLEY M. (ed) (1983) "The Ethnography of Schooling." Bemrose Press Ltd.

I.P.S.E. (INITIATIVES IN PRIMARY SCIENCE: EVALUATION.) (1988)
"An Interim Report of the 1985-1988 Primary Science Projects Supported by Educational Grants."

APPENDICES.

APPENDIX 1.

RESEARCH DATABASE.

DATA	PURPOSES OF COLLECTION	TECHNIQUES USED	WHERE SITUATED
Course publicity App.2	To make explicit the context in which evaluation operated.		Box file archive
Evaluation Reports (see Johnston J,1986-1989)	To publish evaluations of courses to steering committee (external validation).	All techniques of Interactionist Evaluation.	Box file archive
Questionnaires			
prior to course	To ascertain course members experience expertise & expectations prior to course.	Discussion & questionnaire	Blank-App.3a & Evaluation Reports Completed-Box file archive & App.3b
during course	To ascertain the quality & matching of course content to course members' experiences & expectations.	Discussion & questionnaire to back up observations.	Blank- App.4 & Evaluation Reports Completed-Box file archive
end of course	To ascertain the quality of the course, relevance to course members & the short term impact of the course.	Questionnaire and discussion using triangulation to ascertain validity of prior ideas.	Blank-Apps.5&6 & Evaluation Reports Completed-Box file archive & Apps.5a&6a
Case Study notes(filled in questionnaires & other details of school & personal experience)	To collate data relevant to course members chosen for further evaluation.	Questionnaire backed up by observation, and discussion.	Box file archive & Apps.7 - 9
School visit notebooks	To collect data on the long term impact of course in the school context	All techniques of Interactionist Evaluation	Box file archive & App.8.

APPENDIX 2

D.E.S. 3/85 - PRIMARY SCIENCE CONSULTANT COURSE

1. Introduction

This course is supported by the D.E.S. who will finance through the L.E.A. for replacements for teachers attending the course.

2. Location

Trent Polytechnic, Clifton Main Site, Clifton, Nottingham, NG11 8NS. Telephone Nottingham 418248, Extension 3251.

3. Aims

a. To increase the teachers' confidence and competence in science at their own level, albeit selected fields. To develop the tactics and strategies to be able to add to this knowledge and understanding when appropriate.

b. To increase their ability to introduce and develop effective science in the curriculum for their own class.

c. To develop the knowledge and management and analytical skills to be able to help others to introduce and sustain science in the curriculum.

d. To produce teachers who are able to become primary science consultants.

4. Links with School

The Headteacher and senior member of staff in each school will be involved in the teachers' work from the beginning. Outcomes will be firmly school based.

5. Duration

7 weeks, comprising 5 separate weeks in the Summer Term 1986, 5 separate days (2 of which may be field weekend) in the Autumn Term 1986 and 1 week in the Spring Term 1987.

6. Number on Course 15 - 20.

7. Applications should be sent to the L.E.A.

Mr. S. Blagg,
Education Officer,
Education Offices,
County Hall,
West Bridgford,
Nottingham.

APPENDIX 3a.

COURSE QUESTIONNAIRE

..... PRIMARY SCIENCE AND TECHNOLOGY CONSULTANT'S COURSE

EVALUATION

Name:

School:

Relevant qualifications:

Science in your classroom:

1. What kind of science do you teach? e.g. topic based, subject based. (please give e.g.s of topics)

2. How do you organise science work? e.g. group, individual, class.

3. Are you able to make provision for children's differing abilities?

Science within your school:

1. Known science background of staff/interest of staff.

2. Importance placed on science in the curriculum.

3. Science schemes used in school.

4. Resources. Are you well resourced? How are resources organised?

5. Do you have a usable science policy?

Expectations of course

What do you hope to achieve by coming on the course?

How do you expect your school to benefit?

Thank your for your help.

Jane Johnston.

APPENDIX 3b.

COURSE QUESTIONNAIRE

3/85 PRIMARY SCIENCE AND TECHNOLOGY CONSULTANT's COURSE

EVALUATION

Name:

School:

Infants School.

Relevant qualifications:

Deputy Head Teacher.
2 year teacher training ('55 - '57) Biology main college study subject.

Science in your classroom:

1. What kind of science do you teach? e.g. topic based, subject based. (please give e.g.s of topics)

   Harvest (potatoes as study) - growing from seed in varying conditions, cooking, tasting.

   Time Including water, sand and candle clocks , shadow clocks.

   Water Floating sinking. Hot and cold water - ice.

   Gravity Including construction of gliders.

2. How do you organise science work? e.g. group, individual, class.

   Group and class topic work, including science, creative writing, observational drawing, art, craft, music etc.,

3. Are you able to make provision for children's differing abilities?

   No.

Science within your school:

1. Known science background of staff/interest of staff.

   Miss _____ has a position of responsibility for science. Rest of staff keen to include any science work relevant to topic work (may not in actual fact consider the work they do as "science" although it fits into this category).

2. Importance placed on science in the curriculum.

Given equal importance although some teachers are more enthusiastic and aware of its importance than others.

3. Science schemes used in school.

No science in operation.

4. Resources. Are you well resourced? How are resources organised?

Poorly resourced.

5. Do you have a usable science policy?

No.

Expectations of course

What do you hope to achieve by coming on the course?

A new enthusiasm, a fresh approach to my own teaching and hopefully able to communicate this to the rest of my colleagues.

How do you expect your school to benefit?

Perhaps a new awareness of the many ways that science can be expanded within the present approach to our teaching.

To liaise with Junior School whose Deputy attended last years course.

Thank your for your help.

Jane Johnston.

APPENDIX 4.

D.E.S. 3/85 PRIMARY SCIENCE CONSULTANTS COURSE

EVALUATION END OF WEEK 1

Ring the appropriate number - 1 low (bad/no use) ..... 5 high (good/useful)

Topic	How interesting	How valuable to you as an adult?	How valuable to you as a teacher?	How difficult	Comments
Problem solving 1. bridge bdg.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	
What is science/ technology?	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	
Problem solving 2. structures, & forces.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	
Problem solving 3. woodlice.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	
Observing children.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	
Animals in schools.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	
Concepts at diff. levels sinking & floating.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	
Technology	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	
Sound	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	

Increased confidence in science.	1 2 3 4 5
Increased confidence in teaching science.	1 2 3 4 5
A worthwhile week.	1 2 3 4 5

APPENDIX 5a.

D.E.S.....PRIMARY SCIENCE CONSULTANTS COURSE

EVALUATION QUESTIONNAIRE - END OF COURSE

Type of school: .....Infant .....Primary.....Junior .....Middle.....Special

Ring the appropriate number. 1 = lowest score, 5 = highest score.

HOW DO YOU VIEW YOUR IMPROVEMENT DURING THE LAST YEAR?

Improvement in knowledge and understanding of scientific method and concepts.

1 2 3 4 5

Improvement in ability to organise practical investigation.

1 2 3 4 5

Improvement in abilities necessary to develop and promote science.

a) organisation of resources 1 2 3 4 5
b) management skills 1 2 3 4 5
c) develop school science curriculum 1 2 3 4 5

Improvement in awareness of recent developments in science education.

1 2 3 4 5

Awareness of cross curriculum implications.

1 2 3 4 5

Improvement in matching pupils needs and abilities.

1 2 3 4 5

Improvement in assessing/monitoring

1 2 3 4 5

How do you consider the course work load? 1 2 3 4 5

How do you view the concern/help of the course leaders? 1 2 3 4 5

APPENDIX 5b.

D.E.S. 3/85 PRIMARY SCIENCE CONSULTANTS COURSE

EVALUATION

Summary of data from End of Course Questionnaire. (High indicates areas of good improvement, Low poor improvement.

18 completed questionnaires.

Areas of improvement.

HIGH

1. Ability to develop school science curriculum.
2. Knowledge and understanding of scientific method and concepts.
3. a. Ability to organise practical investigations.
   b. Organisation of resources.
4. a. Awareness of recent developments in science education.
   b. Awareness of cross curriculum implications.
5. Management skills.
6. Matching pupils needs and abilities.
7. Assessment/monitoring.

LOW

The course work load was considered to be light.

The course leaders help and concern was well regarded.

APPENDIX 6a.

D.E.S.....PRIMARY SCIENCE CONSULTANTS COURSE EVALUATION

Type of school: .....Infant.....Primary.....Junior.....Middle

Previous science experience

Aims of Course: Have we succeeded in fulfilling these aims?

1. Increase in confidence and competence in science at own level.

   Degree of success.

   1 2 3 4 5 (1 low .... 5 high)

Comments

2. Increase in ability to introduce and develop effective science in the curriculum for own class.

   Degree of success.

   1 2 3 4 5

Comments

3. Increase in management skills (i.e. ability to develop knowledge and analytical skills to help others to introduce and sustain science in the curriculum.)

   Degree of success.

   1 2 3 4 5

Comments

4. Would/Do you feel confident in the role of science consultant/co-ordinator?

APPENDIX 6b.

D.E.S. 1/86 PRIMARY SCIENCE CONSULTANTS COURSE.

EVALUATION

Type of school:

.....Infant.....Primary...√.....Junior.....Middle

Previous science experience

None

Aims of Course: Have we succeeded in fulfilling these aims?

1. Increase in confidence and competence in science at own level.

Degree of success.

1 2 3 √ 4 5 (1 low .... 5 high)

Comments

Felt practical sessions did not really go into enough depth to improve upon the general knowledge I already have.

2. Increase in ability to introduce and develop effective science in the curriculum for own class.

Degree of success.

1 2 3 √ 4 5

Comments

Much to do with the reasons as above. Also did not feel much input on example of good classroom practice or organisation.

3. Increase in management skills (i.e. ability to develop knowledge and analytical skills to help others to introduce and sustain science in the curriculum.)

Degree of success.

1 2 √ 3 4 5

Comments

I felt this was perhaps the area I needed most help with but though more management sessions were requested earlier in the course, the resultant programme did not have enough structure to be much use.

4. Would/Do you feel confident in the role of science consultant/co-ordinator?

I do feel more confident and have, as a result of being on the course, led a number of staff meetings and two inset days on science.

APPENDIX 7

Problem solving activities, discussion documents and analysis from the course member in case study 3.

Work done with two class teachers on problem solving .

A Science-based Talking and Listening Activity

Teacher Information

This problem-solving activity involves children in a group learning situation of a practical nature which requires very close co-operation in discussion of ideas, creation of a design and the execution of a model within the constraints outlined by the instructions and by the materials provided.

Ideally you should be present as a background observer but you should not need to offer advice since the children can reasonably expect to reach a solution at whatever level and there are no right or wrong answers. The only criterion for success or failure in a scientific sense is in terms of the design satisfying the problem. All members of the group should be fully involved at all stages of the problem-solving process. If the activity appears to be "failing" as a result of lack of member co-operation or leader dominance it is up to the discretion of the teacher to intervene or not in the interest of progress. You may wish to leave the group to settle this for themselves with a view to discussing the necessity for team work at the end of the session.

You should expect them to discuss, at their own level, the variables which will determine the successful construction of the tower, i.e. those of stability/rigidity related to height and shape and the potential for adaptation of the material provided. You should be able to observe, from their discussion and design construction, whether they have already assimilated concepts of the nature of which are "strong" geometric shapes and which will form rigid, stable structures. They should also discuss their strategy for working on the tower so that all members are involved i.e. delegation of jobs.

Instructions to the Working Group

Materials Provided : 10 sheets of A4 size duplicating paper and glue.

Your Problem : Build the tallest tower that you can from the ten sheets of paper and the glue provided. You will need to discuss the design and work with all the members of your group. The tower must stand steady enough to be measured.

Follow-up Discussion

Talk with the children about their selected approach to the problem and ask them to analyse (describe and explain their reason for) the way in which they worked in relation to the results which they achieved. Ask them to describe the steps which they followed in order to reach the desired goal. Allow them time to discuss whether they were totally satisfied by the way in which the group worked together or if they can think of any ways in which this could be improved upon.

Building a Tower - Record Sheet

Broadly, the children should discuss co-operatively the variables which they think are involved in the building of the tower and the making of a hypothesis as a statement of belief e.g. "We think that the tower can be made stable by building a triangular base because this is a strong shape. We think that the vertical part needs to be build of a strong rigid shape and we have chosen tubes to do this."

RESPONSES OBSERVED		YES	NO
1.	Involvement of all members of the group in discussion		
2.	Involvement of all members of the group in decision making		
3.	Involvement of all members of the group in building		
4.	Discussion of variables (strength in shapes and structures, rigidity)		
5	Formation of an agreed hypothesis		
6.	Good group co-operation (sharing ideas and tasks)		
7.	Further hypothesis made during the work		
8.	Followed logical process of thought, discussion, reflection activity and analysis		
9.	Ability to look at progress/usefulness of ideas objectively and critically		
10.	Did the children find the problem interesting/ challenging?		

Danny Fox and the Stranger/The Midnight Fox

Problem Solving Activity

This activity is designed to complement the previous observational work done by Mrs. ....., which involved observing the evaporation of water by boiling and condensation of water vapour by cooling. The problem set will serve also as an indicator of the level of the children's conceptual development and their ability to organise their thoughts and background knowledge in logical scientific process to reach a desired conclusion i.e. a solution to the set problem which satisfies them at their own level of development and understanding.

Procedure

1. Divide the children into suitable working groups giving regard to personality and general levels of ability.
2. Provide the materials and equipment and explain that they may use any or all of the things to help them with their work.
3. Explain that they must work together as a group in discussing the problem and ways of solving it and in setting up any experiment which they may feel is necessary.
4. Explain that the teachers are not there to provide answers since groups may find different ways of solving the problem and there may not be just one correct answer.
5. Set the Problem: "On what kind of day would your Mum's washing dry the fastest? Discuss this with your group and design a fair test to find out the answer."
6. Take the role of an impartial observer and try to observe the responses of either one selected child to the problem or the response of a particular group. This may be done by tape recording the discussion and or by recording manually on a prepared sheet.
7. If any group is in obvious insurmountable difficulties you may like to provide a minimum of guidance to start the ball rolling.

Problem Solving Activity - Record Sheet

What to look for

Broadly, the children should discuss co-operatively the variables which they think may be involved in the process of drying washing (evaporation). This should be followed by the making of a hypothesis as a statement of belief e.g. "We think that to dry washing well you must have both sunshine and wind." They should then discuss ways of setting up a fair test or tests as a means of verifying their hypothesis. The test should then be set up and lastly the results analysed critically and objectively.

RESPONSES OBSERVED - TICK BOXES		YES	NO
1.	Discussion of factors affecting drying.		
2.	Recognition of relationship between drying and evaporation		
3.	Isolation of separate variables to be tested		
4.	Formation of an agreed hypothesis		
5.	Discussion of equipment required		
6.	Ability to set up the tests		
7.	Selective use of materials and equipment		
8.	Appreciation of the need for accurate measurement of water		
9.	Appreciation of the need for standard amounts of fabric		
10.	Appreciate of the need for standard type of fabric		
11.	Appreciation of need for good record keeping of procedure and results		
12.	Good group co-operation (Sharing ideas and tasks)		
13.	Do they make further hypotheses during the work?		
14.	Do they follow a logical process of thought, discussion, reflection, activity and analysis?		
15.	Are they able to look at their results critically and objectively?		
16.	Did they consider that their investigations had been successful?		
17.	Were you yourself satisfied that the exercise was useful or enlightening?		
18.	Does recording responses in this way help with your understanding of your children's conceptual development?		

Science Discussion Document - Staff

Please consider the following questions with a view to discussing the future development of science teaching in school and the re-evaluation of the science scheme as it currently stands. Be perfectly honest in your comments and if you have any suggestions to add do not hesitate to do so.

Also consider what you feel to be the most important role of the science co-ordinator as it concerns you personally.

---

1) What are your personal feelings with regard to the teaching of science in your classroom.

2) In the past, would you say that you have used the science scheme to plan your work -

   a) by following it closely?
   b) by selecting useful information from it?
   c) by never using it?

3) If you never use the scheme please give a reason / reasons.

4) What aspects of the scheme do you like or feel are worthwhile? Why?

5) What aspects of the scheme do you dislike or feel are of little use? Why?

6) What is your opinion of the present format of the scheme? Choose by ticking ->

a) too much emphasis on content

____

b) too little emphasis on content

____

c) little guidance on developing skills

____

d) sufficient guidance on developing skills

____

e) little guidance on concepts covered by specific topics

____

f) sufficient guidance on concepts covered by specific topics

____

g) easy to work through

____

h) gives sense of educational progression

_____

i) contains too much detail

_____

j) contains too little detail

_____

k) is too restrictive on own topic needs and personal creativity

_____

l) is too cumbersome and complex to be a practical scheme

_____

7. Would you use a scheme if it presented a format giving more freedom of topic choice.

8. To what extent would you feel confident about planning your own science activities as an integral part of topic work within an agreed framework of skills and concepts.

_____

_____

_____

_____

_____

_____

9. What do you perceive as any problems for you personally using such an approach?

_____

_____

_____

_____

_____

_____

10. Do you feel that in addition to a progressive structure of skills and concepts learned through science activities, there should also be a certain "core of knowledge" which children should experience in the primary school?

11. In which areas of science do you feel:-
Most confident/least confident? (Be specific)

12. Would voluntary workshops help with your problem?

13. What format would you find most useful in a workshop?

14. In what other way would you like personal support and/or guidance from the science co-ordinator?

15. What do you see as the role of the science co-ordinator in relation to the staff and to the development of a science curriculum?

16. Do you feel that you use the resources room fully? If not, give reasons.

17. Any suggestions for improvement of the resources area.

18. Any other comments?

Link Work Report

Following the three week course in June I prepared a plan of action beginning with the autumn term and discussed this with the head teacher at some length. She was at some pains to emphasise that she did not wish the staff to be put under any further pressure that term so nothing would be started until September. Plans had already been made for a school project for the autumn term which was to involve everyone with local industry. Most teachers had already planned their work in a fair amount of detail, planned visits etc. so to plan a separate topic as requested by the 3/85 tutors was inappropriate I therefore decided to follow my plan and involve myself with the projects of each individual teacher by providing support, help and guidance in planning and carrying out appropriate science investigations. This approach was successful and well-received by all staff and the amount of staff/consultant interaction has increased tremendously this term.

One of the first parts of my long term plan was to identify any problems in school which might be influencing science education. Since we already had a written science scheme I felt it was important to assess the degree to which it was being used, how it could be improved or changed and most importantly colleagues' personal feelings towards the scheme and towards science teaching in general.

I prepared a questionnaire which was designed to ask these questions in some detail. I also decided that rather than holding a large staff meeting with all thirteen staff, it would probably be more useful to discuss the questionnaire with each teacher individually. This was principally because I had a strong suspicion that most people had let their science teaching slip quite badly and were actually making little use of either the scheme or the resources room, (This was mainly due to upheaval in school after a change of headship). Personal discussions in which they were encouraged to be absolutely honest without fear of embarrassment seemed to be the best choice.

Arising from these personal discussions, for which I took two days cover, I prepared and gave a résumé of people's comments collated from the interviews and completed questionnaires. The main outcomes were discussed and it was agreed that the next step towards a topic-based science scheme should begin with a working party in November. At this point we will discuss cross curricular skills and concepts, including science, with a view to arriving at a list agreeable to all and on which we may consider basing a practical topic scheme

The level of concern among staff about their perceived inadequacy in certain areas of science knowledge and understanding. It was agreed that I would hold fortnightly science workshops on subjects requested by the staff. We began with a C.D.T. session on techniques for buggy building, use of tools and materials. Other topics covered in succeeding sessions were magnetism and electricity. The workshops have been well attended and are expected to continue as the development of the science scheme progresses.

A résumé of the comments of the staff follows and this will provide the basis for further working party discussions and curriculum developments.

Outcomes of Science Discussions

Personal feelings about teaching science.

Some teachers still feel intimidated by the idea of teaching science. There appeared to be a significant degree of unwillingness to be involved in a really meaningful way in isolated cases. I think this results from the individual's poor understanding/appreciation of what primary science is all about and a tendency to link it with the kind of science which they learned at secondary school and hated. These people still feel inadequate in many areas of science, particularly anything termed physical science, but felt more at ease with natural science/natural history. They are thus afraid to allow the children to explore fully in case they themselves are unable to understand or guide the work. For these people there is a distinct difficulty in perceiving the science inherent in a topic and/or a tendency to steer clear of topics which might present them with a fait accompli. Such teachers obviously need and will be given, encouragement and support in planning and development of appropriate scientific activities and in trying out areas of science which have hitherto proved difficult to them.

Generally, though, teachers have appeared enthusiastic and willing to work through science and do appreciate the benefits of such work. There was also a feeling amongst some that language and number work should take priority, particularly with the younger children, but with time and good topic planning these can be an integral part of scientific experience.

The effective organisation of activities within the classroom was a concern voiced by nearly everyone. Most people adopt a group work approach in which they help and guide the science activity group as necessary while other children work on related research, art or other tasks which require less immediate guidance.

Physical sciences (i.e. those perceived as having a bias towards chemistry, physics, structures and material) seemed to be the greatest cause for concern on a subject level. Everyone commented that voluntary workshops and on-going support from the science consultant would help to alleviate the problems of lack of bias knowledge and experience in the practical aspects of setting up activities in the classroom.

The Present Scheme.

The scheme in its present form was particularly liked by the first year staff because it links quite closely with their traditional topic choices and provides good resources and detailed planning guides.

In general, though, no-one adhered strictly to the scheme as written but selected material from it as required by personally chosen topics. The original format and detail is therefore to a large extent now of limited use and does not contribute to ..?..of ideas as initially planned.

More guidance on the skills and concepts which can be developed by scientific activities is required and less emphasis on content, since most people prefer to have a free choice of topics for their class. Obviously a totally free approach will present problems with regard to achieving a satisfactory progression and continuity in the development of children's knowledge, skills and concepts and a balanced experience of different aspects of science. Most people said that they would like the present scheme on hand as a guide and reference aid for use in planning activities.

The majority of staff said they would feel fairly confident about planning their own science within topics provided that the science consultant could be called upon to help with suggestions for practical planning and activities in the planning stages and during the development of a topic. The problem perceived in using such an approach was that of ensuring educational continuity and progression of scientific experience and a balance of subject areas. Most people felt that this problem could be solved by developing a topic framework and concepts/skills guide-lines within which to work. This would give freedom of topic choice and the research that we are building progressively upon agreed skills and conceptual foundations appropriate to the primary school and it .....

The Resources Room

I feel that we have a good resources area and this is being used quite well and that staff are agreed on the need to monitor the children using it. I feel that there is, however, a need for more resources aimed towards the younger children to encourage research activities e.g. more good quality science activity books/cards at a 6 - 8 year reading level.

APPENDIX 8a

Complete Data Collected for Case Study 2.

INITIAL EVALUATION QUESTIONNAIRE (See Appendix 3a).

1/86 PRIMARY SCIENCE AND TECHNOLOGY CONSULTANT'S COURSE

EVALUATION

Name:

School: *Junior School (class age 9-10)*

Relevant qualifications:

Science in your classroom:

1. What kind of science do you teach? e.g. topic based, subject based. (please give e.g.s of topics)

   Science taught at the moment is mainly in connection with project work. Each year group follow different topic areas eg. 1st years - weather, 2nd years - cold lands, 3rd years - British Isles, 4th years - literature based topic.

Science within your school:

Known science background of staff/interest of staff.

Staff keen to attempt science but are not very confident in areas other than mathematics or natural science.

Science schemes used in school.

McDonalds - not used very widely.

Importance placed on science in the curriculum.

We are all aware of the importance of teaching all the necessary skills and concepts, but again we feel a certain lack of confidence.

Expectations of course

What do you hope to achieve by coming on the course?

> *To increase my own knowledge and competence which will then allow me to support and help colleagues in implementing a science policy, and integrating this throughout the curriculum.*

How do you expect your school to benefit?

> *The school should benefit from the above; and from being able to approach areas of the curriculum in a scientific way.*

END OF COURSE QUESTIONNAIRE

D.E.S. 1/86 PRIMARY SCIENCE CONSULTANTS COURSE

EVALUATION MARCH 1988

Type of school:

.....Infant.....Primary....√....Junior.....Middle

Previous science experience

None to speak of.

Aims of Course: Have we succeeded in fulfilling these aims?

1. Increase in confidence and competence in science at own level.

Degree of success.

1 2 3 4 √5 (1 low .... 5 high)

Comments

From doing very little science at all, I now have a programme of topic based science for my class which is working well.

2. Increase in ability to introduce and develop effective science in the curriculum for own class.

Degree of success.

1 2 3 4 √5

Comments

As above.

3. Increase in management skills (i.e. ability to develop knowledge and analytical skills to help others to introduce and sustain science in the curriculum.)

Degree of success.

√

1 2 3 4 5

Comments

Have not had the opportunity to put these into practice, but I feel confident enough to try.

4. Would/Do you feel confident in the role of science consultant/co-ordinator?

If more time were given within the school situation.

Extract from 1/86 school visits notebook, documenting evaluation visits to school in case study 1.

First school visit.

A. Science in school.

Known science background of staff.
None.
Main enthusiasm natural science and maths.

Schemes/policy used in school.
Science Horizons and resources to do it.
McDonalds.

How is science taught in school.
Within classes as one offs, part of maths. and topic work.
Felt to be weak.
Each year group follows different topics and science input depends on project.
Class lessons, groups and individual work evident.

Importance placed on science within the curriculum.
Felt to be a weak area of the school curriculum but one that is highly valued.
Head Teacher has agreed to provide some extra release time for Mrs.....

Expectations of Course.
Confidence boost.
The course is hoped to provide input necessary to develop a workable science policy (Discussion document for September 1987 if possible) with ideas on how to develop science throughout the school.
The Head is very impressed with the standards of science within the Infant School (on 4/84) and feels the Junior School falls down in providing further developments.

The course member hopes to increase own knowledge and as head hopes to develop science policy document for use with whole school.

How did you view initial week of course?

Very good.

Points to note for 3 week are ideas on organisation of science within class.

Details of science policy/record keeping.

Hoped that document will be developed as a result of the course.

Second School Visit.

A. Head Teacher

Two visits made.

On first teacher away and Head Teacher was very reluctant to speak. Impression was that he was apprehensive re discussing science.

On second visit conversation took place in corridor as again he appeared very reluctant to discuss science. On being pressed he commented that staff had been consistent and were interested in science.

Benefits to school.

Programme/policy been devised which should take effect next academic year. So next year was all important. All staff were teaching science and science was decidedly "better".

B. Teacher.

Mrs..... now feels very confident re science on a personal level.

She has an on-going programme of topic based science which is working well.

She felt the course was the right balance for her needs.

She has not been able to use 2 1/2 days of her cover because of lack or Head Teacher support.

Changes in science education during the year.

a. Classroom science much more evident.
   Science is more problem solving.
   Variety of approaches used with success.
   Children appear to know what they are doing .

Within School.

b. School science was harder to assess.

Mrs..... knew little about that went on in other classes apart from parallel class with whom she worked.

She knew especially little about 1st and 2nd years *(Year 3 and Year 4).*

She said that there was little time provided to look at and assess science.

Benefits to school

Benefits mainly in Mrs..... as resource (although not used to full potential).

School has had in-service which enthused most staff but Mrs..... felt Head Teacher was paying lip service to science at it "was the thing to do" but that his commitment was weak.

There was not great evidence of science on-going in classes other than Mrs..... and parallel class.

Head Teacher as a result of visit had given Mrs..... £700 to purchase more resources for science!!?

Policy details/revision.

Due to little release time to visit other classes/assess etc., staff had not agreed upon a policy and Mrs..... had formed one on her own which she was presenting to them for implementation in September 1988.

Further support needed.

Polytechnic visits have helped Head Teacher to see other Head Teacher commitment.

Without support from Head Teacher it would appear unlikely that the new policy will succeed and that science throughout the school will improve. Mrs..... is pessimistic re Head Teacher commitment and feels it is simply window dressing.

However Head Teacher is away for academic year 1988 - 1989 and Deputy Head Teacher will be acting Head Teacher. She is more committed and it is felt that science stands a better chance of development with her support.

Other staff changes expected due to maternity etc.,

Third school visit.

Changes during the last 2 years.

Head Teacher was out of school on secondment for year 1988-1989.

One younger teacher, new to staff.

Deputy Head Teacher who had been acting Head Teacher for year had been promoted and a new Deputy Head Teacher was due to start next term (science expertise).

The biggest change was in the attitude of the Head Teacher who appeared relaxed, secure, welcoming and open.

As I spoke with him the word 'mellowed' sprang to mind and it was echoed by Mrs..... who used the term to describe him.

He spent an hour discussing the school and its changes, no development of science etc.,

Mrs..... felt that Head Teacher's secondment had resulted in his change of attitude. He had visited many other schools during his time and now felt secure in his school and in science education.

Impact of D.E.S. course.

The D.E.S. course provided firstly and mainly confidence and expertise in science which enabled Mrs..... to develop a policy document (see details). It was a workable document that had been developed with care and attention to details along with full co-operation of her staff.

Its implementation from the academic year 1988 was successful.

All teaching is through a "thematic" approach and each "theme" takes up 1/2 a term and is roughly designed to encompass one science area (adapted to fit AT's not difficult as most AT's were taken into consideration in the original policy).

Mrs..... attended a course last year about science and the N.C. which helped her to adapt the policy to encompass new thinking.

Continued innovation since course.

Staff have adapted well to ideas and it appears to be very successful. They are however beginning to realise that a "theme" will often involve more than one AT and that since mini topics will, help to cover aspects of the science N.C. not easily covered in "themes".

Development of staff appears to be great. They are in the process at the moment of submitting request to join Nottingham Technology Project. If successful they see this as extensions of their development as it will assist development of the weakest part of their science development, that of technology and problem solving. Having said that

evidence of problem solving approaches in class of 4th years *(Year 6)* bridge building was good.

Follow-up support.

They have successfully followed up initial impetus without outside help.

The best assistance to the staff has been "time" to get out of the class and help staff to use science.

Other comments.

Despite Head Teacher change in attitude little praise had been attributed to Mrs..... and other staff re development of science.

I was able to communicate this praise to both her and Head Teacher on how well developed I felt their science curriculum to be.

During this academic year staff had chosen to monitor and assess what a child in their class or all the children in their class had done in one day/week/month. They found it only really possible to monitor one child successfully and chose ta a typical child in the class. The results indicated that children had a very balanced education and that large amounts of science were being done. Difficulties arose because some tasks encompassed more than one subject area. There was no Head Teacher guidance on this but staff were keen to attempt it.

Details of policy.

- Introduction.
- Aims and objectives of science in school.
- Skills, attitudes lists.
- Subject headings e.g. Earth in Space, Water.

Which covered most of N.C. and only needed slight adaptation to accommodate N.C.

* Ideas of how to teach areas with reference to suitable workcards in school etc. (Science Horizons, Look!).

  Ideas were based on a two year cycle with all "subjects" covered in lst and 2nd years (Year 3 and Year 4) and repeated in 3rd and 4th years (Year 5 and Year 6) using different topics.

  All areas of the curriculum are taught mainly through "thematic" approach with only real exception being maths, where skills are acquired and then used in topic. Therefore issues of continuity and progression had been taken into consideration.

- Resources needed to achieve above.

- Record-keeping sheet which indicates areas of science "covered". Aspects of assessment had been considered and teachers this year were attempting to assess children within their class but found there were immense problems to overcome.

APPENDIX 8b

Extract from 9/87 school visit notebook, documenting first evaluation visit to school in case study 5.

School

A small ..... village with a middle class catchment area. 5 classes. 1 reception taking rising 5's in the September before the 5th birthday. I transitional/middle class working in association with D.H.T. with a class of vertically grouped middle/upper infants.

Science in school

Known science background of staff

Mrs ..... was a secondary science teacher but others have very little science background and are lacking in confidence although they are enthusiastic and interested.

Schemes/policy used in school

Resources are very limited. Include a selection of workcards e.g. Look, MacDonald, Craigie.
Mrs. ..... says H.T. is very unwilling to spend money on resources.

H.T. says that Mrs. ..... is very keen to purchase a large number of resources, but she wants to wait until after the duration of the course to decide which ones will be most useful. Then she wants to put a large input in science. There is a resources area in school being set up with all the science equipment.

How is science taught in school

Thematics approach, with vertically grouped children of 5, 6, 7. Science is developed out of a chosen theme. A two year cycle of themes is being organised to ensure continuity and progression. There was evidence of good science in all classes although teachers were obviously lacking in confidence e.g. Science through music, food, hot and cold, balancing Santas, the local church (evidence of CDT and Technology).

Importance placed on Science within the Curriculum.

Teachers are now expected to provide a science content in balance with N.C. and work is being done on this. Good science was evident and work was obviously in progress with a view to continuity and progression. Much of the science work carried out was done without real knowledge of science or confidence.

Expectations of Course

H.T. hoped it would increase teachers'g158
confidence, given guidance on building up resources and help to prepare curriculum for N.C.

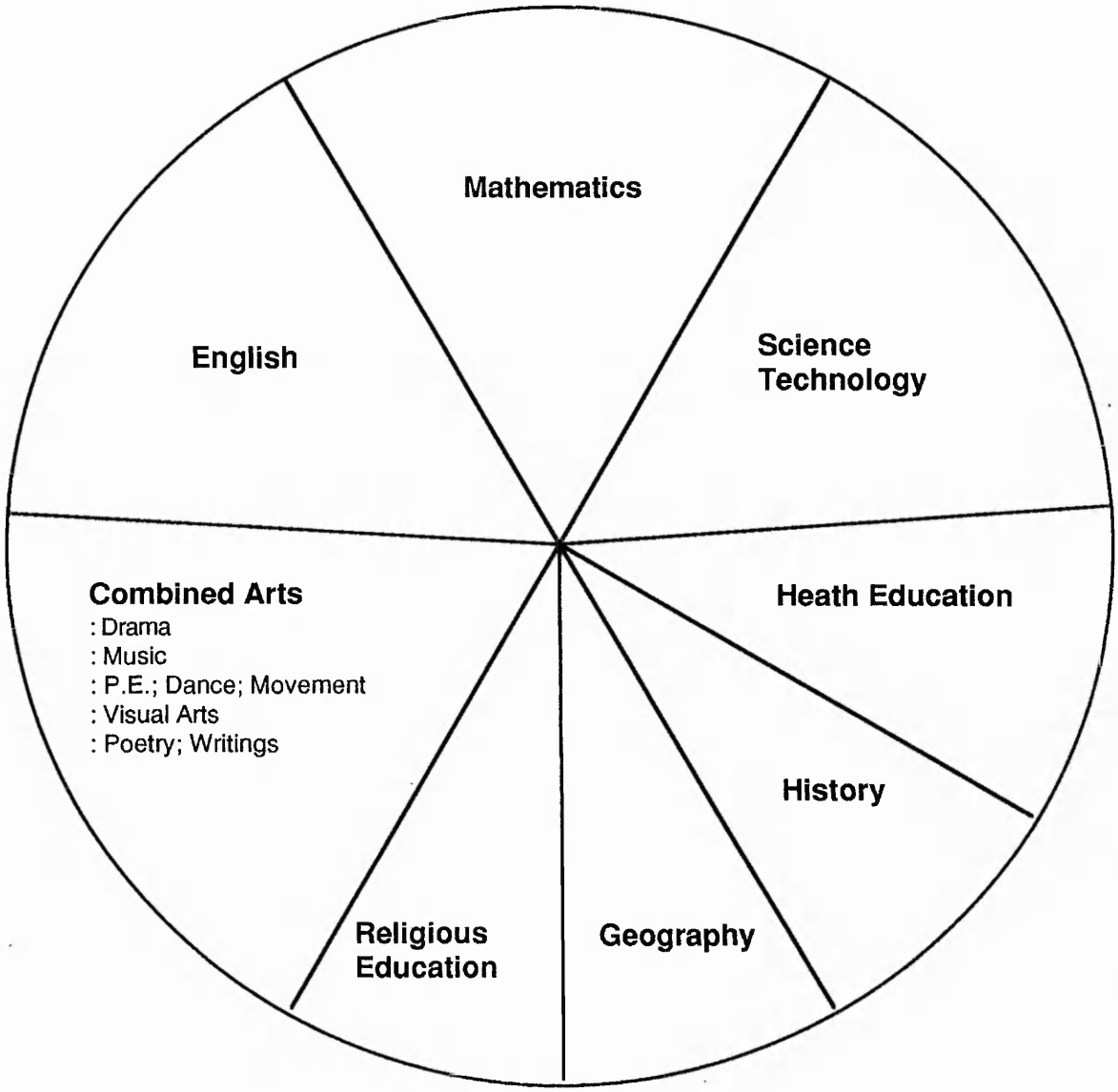
Mrs. ..... shared these expectations.
Both felt they were being fulfilled.
H.T. asked how I felt her school was achieving with a view to the N.C. We discussed how best to prepare for September 1989; much of which was being done.
I discussed my views of preparation of needs of school plus costing necessary for implementation.
I also asked H.T. to pass on my opinion of staff's good progress.
Mrs. .....was worried that progression ends on entering Junior School.

Appendix 9

Academic Year 1988/89

Thematic Approach

Teacher's Curriculum Record Chart



Class Teacher .....

APPENDIX 10.

RESEARCH AUDIT.

KEY TECHNIQUES	EXEMPLAR IN DATA
DATA COLLECTION PHASE	
Observation	•C.S.2 Observations of HT in school to ascertain his commitment to science development (para3.4.2) •C.S.4 Observations of interactions between HT & science co-ordinator (para3.6.5) •C.S.5 Observations of school development during second visit (paras3.7.2-3.7.5)
Questionnaire	•At the start of the course to ascertain expertise and expectations (Appendix 3) •During the course to ascertain course quality & achievement of aims(Appendix 4) •At the end of the course to ascertain development of key areas (Appendix 5) •At the end of the course to evaluate the success of the course aims (Appendix 6)
Discussion with individual	•C.S.1 Discussion with course member re developmental progress (4/84 Report p16) •C.S.2 Confirmed HT lack of commitment (1/86 school visits notebook & para3.4.3)
Discussion with groups	•C.S.4 Discussion with H.T. & Science Co-ordinator re effect of course on development (3/85 school visits notebook & para3.6.5) •Discussion with course members on course (para1.3.1 & evaluation reports eg.4/84p.4) •LEA support group meeting (para3.2.4 & 4/84 report p.15)
DATA PROCESSING PHASE	
Focus (Generating Theory) Course lacked relevance to Infant Teachers	•C.S.1(para3.3.4 & 4/84 Reportpp8,16 & 17) •3/85 Questionnaire & 3/85 Report p29

National changes affected attitudes to school Science development	•C.S.4 (para3.6.5 & 3/85 school visits notebook & completed questionnaires) •C.S.5 (para3.7.3, 9/87 school visits notebook & school documents) •9/87 Report pp32 & 33
Importance of support in school context	•C.S.3(paras3.5.4-3.5.7 & 3/85 school visits notebook)
The effect of relationships on science development	•C.S.2(paras3.4.2-3.4.3 & 1/86 school visits notebook) •C.S.4(para3.6.5 & 3/85 school visits notebook)

Internal Validation (Triangulation)

Triangulation of ideas re lack of relevance to Infant teachers	•C.S.1 (para3.3.4, 4/84 Report p17 & 3/85 Report p26) •C.S.4 triangulation between schools (para3.6.1)
Verification of relationship between HT & staff & lack of commitment to science development	•C.S.2 (para3.4.3 & 1/86 school visits notebook)
Attempted verification of relationship between HT & course member	•C.S.4 (paras3.6.5-3.6.6 & letter in database)
Verification of development with science co-ordinator	•C.S.4 (paras3.6.5-3.6.6 & school visits notebook)
verification of resources issues with HT & course member	•C.S.5 (para3.7.2 & 9/87 school visits notebook)

DEVELOPMENT PHASE

Formulation of conceptual ideas and methodology

Positive interaction

Supporting & encouraging general developments.	•C.S.1 (para3.3.4)
Supporting & encouraging course member in her policy formation	•C.S.3 (paras3.3.5.5-3.5.6)
Giving positive feedback on school development	•C.S.5 (para3.7.3)

Negative interaction

Encouraging changes in HT attitudes to Science	•C.S.2 (para3.4.3)

Encouraging HT to change her plans to consider assessment & monitoring at a later date.	•C.S.3 (paras3.5.5-3.5.6)
Non substantive interaction	
Not discussing policy details	•C.S.2 (para3.4.6)
Resources improvement despite non interaction	•C.S.2 (para3.4.6)
Not entering into debate regarding resources	•C.S.5 (paras3.7.3-3.7.6)
Modifications	
Difficulties in impartiality lead to modifications in the evaluation role.	•C.S.1 (para3.3.4 & 4/84 report p16)
Influence of other methodologies affected developing methodology & led to changes.	•Part 1 of thesis
Changes in emphasis in data collection.	• 3/85 Report p.1, 1/86 Report p.1 & para4.3.4

REPORTING PHASE

External Validation (Report writing)	
Make explicit methodology.	•1/86 Report p32 & other Evaluation Reports (4/84, 3/85, 9/87)