
Aspects of Case Study Research

as illustrated through

A Case Study of Investigative Practical Work in a Year 12 Biology Programme¹

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Introduction

The increased acceptance of qualitative research has again sanctioned the case study approach as an acceptable research strategy for educational studies. The case study has even been presented as the 'prime strategy for developing educational theory which illuminates educational policy and enhances educational practice' (Bassey, 1999: 3). Case studies are the preferred research strategy when 'how', 'what' and 'why' questions are being asked, when the researcher has little control over the event or when the research is being carried out in a real life context (Burns, 1990, Yin, 1988). Yin defines a case study as:

an empirical study that investigates a contemporary phenomenon within its real-life context; when the boundaries between the phenomenon and context are not clearly evident; and in which multiple sources of evidence are used

(Yin, 1988: 23).

Case studies allow a researcher to 'reveal the multiplicity of factors [which] have interacted to produce the unique character of the entity that is the subject of study' (Yin, 1988: 82).

Case study research has many faces. The purpose for the study, the size of the unit under study, the range of data gathering approaches used and the overarching

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methodological paradigm for the study all contribute differences. Case studies may involve description, explanation, evaluation and prediction (Thomas, 1998). Bassey (1999), defines a range of purposes for educational case studies that include theory-seeking and theory-testing case study, story-telling and picture drawing case study and evaluative case study. My study of Year 12 biology teachers and students carrying out investigative practical work was both theory seeking and evaluative.

Typically involving the observation of a bounded system or 'unit', a case study may be developed around an individual or extended to cover a community or culture. However, if a culture is the 'unit' under study then the research more typically becomes ethnographic, since the guiding questions may be more directed at finding out the shared beliefs of the members of the culture rather than the individualistic attributes of a person or institution.

Many case studies involve people working within their regular environment such as the research that I will be anchoring this discussion around. The 'unit' for that case study was four Year 12 biology teachers and their students within one school. This school is a large co-educational urban school which, for the purposes of the study has been called City High. In the second year of this study the focus narrowed to one of these teachers and her students. In the third year the case 'unit' expanded to 31 Year 12 biology teachers and their students in 22 other schools in New Zealand.

Why do we carry out case study research?

Burns (1990) lists six reasons for carrying out case studies. Firstly, he claims that they are valuable as preliminaries to major investigations as they generate rich data that may suggest themes for more intensive investigation. Secondly, he claims that since case studies 'have the aim of probing deeply and analysing intensively' (p. 366) the many phenomena that make up the activities of the unit under study, then generalisations to the wider population may be possible. Thirdly, he indicates that case studies may generate anecdotal evidence that can illustrate general findings.

Fourthly, case studies may serve to refute generalisations. Fifthly, a case study approach is preferred when pertinent behaviours cannot be manipulated, and finally, a case study may be the best possible description of a unique historical event.

In the study I am focussing on here, the first year's case study served to suggest more focussed directions of inquiry for the study in the second and third years. There was also a richness of anecdotal evidence gathered from the students and teachers over the three years of the study that served to support the interpretations and possible generalisations arising from the data analysis. Additionally, the behaviours of the students and teachers could not be manipulated as would be required for an experimental study. Thus the project fitted four of Burns' (1990) suggested reasons for carrying out case study research. It also had the potential to refute the generalisations about student investigators that could be found within the New Zealand science and biology curriculum documents.

The overarching research methodology for the project

In this research project the data were gathered, analysed and discussed with the participants within an interpretivist paradigm. Such an interpretivist approach, with its goal of revealing the participant's views of reality (Lather, 1992, Robottom & Hart, 1993) allowed the understandings and reasons for actions of the participants to be elicited (Borg et al, 1993, LeCompte & Goetz, 1982).

The use of case study (Yin, 1988) and naturalistic inquiry techniques (Lincoln & Guba, 1985, Smith, 1982, Welch, 1983) enabled analysis of a multiplicity of classroom dynamics and teaching approaches (Brown, 1992). Case study also allowed an examination of a range of preferences, motivations and actions of students and teachers and the development of a shared understanding by all parties to the research (Mather, 1995).

An interpretivist framework also enabled close collaboration between the researcher and teachers. A persistent concern in science education is the minimal impact of

research on practice (Tobin, 1988). Research which involves collaboration between researcher and teacher, which focuses on an issue identified as significant by the teacher and which is carried out in the classroom is more likely to have impact on practice (Huberman, 1993). Huberman noted the more pronounced impact of research findings on practice if the researcher-teacher relationship involves interaction over a length of time. In this case study exchanges occurred before and during the study and during the data analysis and write-up phases. The close collaboration between the researcher and the teachers allowed them to more readily reach agreement about the significance of the gathered data (Lin, 1996).

Another reason for using an interpretivist framework was that it allowed for the complexities of different classroom situations to be acknowledged and explored. Throughout the three years of the research project data were gathered from a number of different schools and classrooms, each with the potential for differing teaching and learning approaches and where teachers and students worked together and defined their relationships in multiple ways. An interpretivist methodology was able to reflect the complexity of such classrooms and research based in these classrooms. In addition, it had the potential to encompass and elucidate the inconsistencies and the personally subjective nature of a teaching and learning context (Eisner, 1984). An interpretivist approach also allowed for an uncovering and description of the research context so that others may be able to connect to the findings and determine the correspondence of such to their own context and then 'imagine whether [the measurement procedures] would yield the same data if replicated' in their context (Borg et al, 1993: 130).

This particular research project was framed by a social constructivist epistemology so that the selected research methodology had to be compatible with and reflect this view. An interpretivist framework allows for an affirmation of the significance of the participants' knowledge:

The constructivist perspective holds as a chief assumption about much complex behaviour that the 'subjects' being studied must at a minimum be considered knowing beings and that this knowledge they possess has

important consequences for how behaviour or actions are interpreted (Magoon, 1977: 651).

This research project required that all participants shared not just in the construction of developing knowledge but also had an understanding of each others' objectives and underlying reasons for participation so that these could also be taken into account (Cohen & Manion, 1994, Johnston, 1990, Lather, 1992). An interpretivist paradigm allowed for this broader and deeper shared understanding through its embedded processes of reporting and discussion at all stages of the development of the story. In this way changes that occurred over time as a result of the intervention could be recorded.

In summary then, the case study approach was appropriate to this research because the research questions posed were of the "how" and "what" types; the focus was on contemporary as opposed to historical events and the researcher had only limited control over actual behavioural events. The case study approach was applicable because the researcher collaborated intensively with the participant subjects to find out their phenomenological perspectives. It was also relevant to use because the phenomena were studied in their total context and observed over a long period of time and thus the researcher and teachers knew what specific instructional situations and contexts were being referred to. The complexity and richness of a typical school biology laboratory provides an abundance of data sources and thus a case study approach was appropriate to use as it typically uses multiple data sources.

Research methods within a case study

Within a case study there may be elements of other research approaches. In my study there were elements of two other approaches: action research and negotiated intervention.

Action research within a case study

For the teachers who participated in the classroom based intervention there was an element of action research (Alcorn 1986, Carr & Kemmis, 1986, Feldman, 1994, Kemmis, 1981, McTaggart, 1989, Peters & Robinson, 1984, Sommer 1987), whose

aim was to 'effect and monitor change in existing practice through an action phase' (Alcorn, 1986: 33) aimed at bringing about a desired end. It is 'research carried out by practitioners with a view to improving their own professional practice and understanding it better' (Cameron-Jones, 1983, in Borg et al: 390). Carr & Kemmis (1986) have linked action research to curriculum development, professional development and school improvement programmes, claiming that these activities had in common:

the identification of strategies of planned actions that are then implemented, and then systematically submitted to observation, reflection and changes (Carr & Kemmis, 1986: 164).

The teachers who participated in the first and second phase of this research project were also involved in a collaborative manner (Johnston, 1990) in defining the problem, selecting a design, sample and measures, analysing the data and in interpreting and applying findings. However, overall the research can not strictly be called action research because the researcher: led most of the decision making; identified the problem which arose from a formal search of literature carried out by the researcher, as well as relating to the commitment of the researcher to science curriculum development and science teaching efficacy in New Zealand; used a research design which incorporated a long time frame; used measurement procedures, some of which were not routinely used in the classroom. However the selection of the schools and teachers who participated in the early phases of the research came from teachers who chose to respond to a registration of interest. In the final year of the research study selection was from teachers who responded to a request after their involvement in a conference presentation by the researcher in 1994. In addition the City High teachers were personally interested in the analysis of the innovation as it was closely linked to concurrent curriculum change and they were actively involved in analysis of the data as it was being generated. They had adopted the researcher's problem as their own.

Negotiated intervention within a case study

As researcher I worked with the teachers and students following a process of negotiated intervention (Simon & Jones, 1992) in which together we determined the direction of the research project, an approach commensurate with action research. Figure 1 summarises the process of negotiated intervention for this research project.

The initial exploration and negotiations

The researcher and the City High teachers together explored the existing situation during a regular biology staff meeting towards the end of a school year. At this meeting the nature of the intervention was established and decisions taken as to when it was to begin in the school. The intervention involved the introduction of open investigative tasks to the practical work programme of Year 12 biology students. The teachers completed an initial questionnaire designed to elicit their views regarding a problem-solving investigative approach to practical work and the researcher carried out pre-intervention student questionnaires and classroom observation. Following discussion of the data gathered up to this point, the specific nature of the investigative tasks was discussed and they were developed, ready to be used in the classroom. On the completion of these tasks there was ongoing evaluation of the data followed by discussion with the participating teachers and students. Further intervention was then negotiated. This process was repeated on a micro level following each of the investigative tasks throughout the two years of the research project at City High. This was repeated on a yearly cycle for two consecutive years.

Later on (see figure 1) a simplified negotiated intervention was followed. The intervention involved the introduction of a method of presenting practical work to students in the Year 12 Biology programme at the school which was different from their normal approach. The students had to carry out investigative problem-solving practical work. These investigations were linked to curriculum topics and the students were expected to apply their prior declarative, and procedural, conceptual understandings to these new situations. Degrees of openness were introduced as students were required to design their own investigations in order to come up with answers to a given problem.

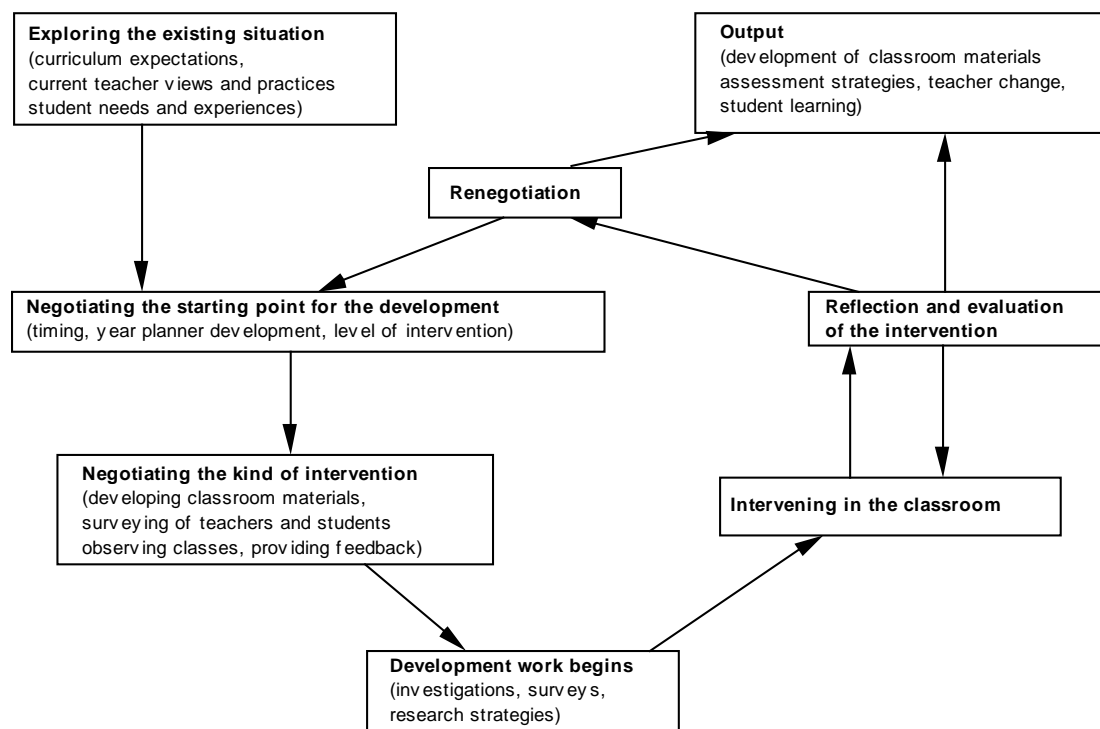


Figure 1: The process of negotiated intervention for this research project.

(Adapted from Simon & Jones, 1992)

Gathering data to develop the case

In order to be able to answer the research questions the project required an approach that would allow for the complex task of monitoring the context specific curriculum intervention over a period of several years. The data gathering methods had to allow for analysis of 'discrete aspects of an educational problem' (Borg et al, 1993: 13), - the goal of quantitative research - and to allow for an overall grasp of an 'educational phenomenon in all its complexity' (p13) - the goal of qualitative research. The research thus required an integration of quantitative and qualitative approaches in order to gain a more complete picture of the changing confidence and abilities of the students and the change of classroom interactions across the period of the research project (Nau, 1995).

There were also limits to the amount of time available for face-to-face interaction between the researcher, students and teachers participating in the research. This

necessitated a combination of both direct (collection of data by the researcher) and indirect means of gathering data.

The data gathered was descriptive in nature rather than experimental, correlational or causal. The gathering and analysis of both qualitative and quantitative data provided a richness of material to support the interpretivist aim of 'understanding the complex world of lived experience from the point of view of those who live it' (Schwandt, 1994: 118).

Qualitative aspects of the research

These aspects of the research project define it as qualitative (Burgess, 1985). Firstly, the researcher worked in a natural setting (Lincoln & Guba 1985), that is, regular Year 12 Biology classrooms. Secondly, aspects of the intervention were designed and redesigned as a result of the students and teachers' interactions with them. Thus the research methods were flexible and allowed for the formulation, reformulation and modification of concepts as the collection and analysis of the data proceeded. Thirdly, the research was concerned with 'social processes and with meanings that the participants attributed to the contextual classroom activities and situations' (Burgess, 1985: 8). In addition, data collection and data analysis occurred simultaneously with categories and concepts being developed during the course of the data collection in the manner of grounded theory approaches (Glaser & Strauss, 1967).

Quantitative aspects of the research

Within the limitations of the number of students carrying out practical investigations, procedures for the gathering and analysis of numerical data were used to establish patterns of responses, such as degrees of confidence with respect to carrying out investigations, or the degree to which students had shared understandings of aspects of investigating such as validity of their gathered data. Such information was used to provide perspectives for the analysis of the qualitative aspects of the research. Similarly findings from a large scale questionnaire of Auckland science teachers' attitudes to, and understanding of, a problem-solving approach to practical work

formed the basis of the questionnaire used early in the project to find out the attitudes of the teachers at City High to such an approach.

Data collection techniques

Cases studies are typically built up from multiple sources of data. The principal data collections approaches in my case study were classroom observation, interviews (formal and informal, structured and semi-structured) and written reports such as planning and evaluation forms and questionnaires. Other data were sourced and gathered in a variety of ways which included taping departmental meetings, classroom proceedings and student groups planning investigations. A questionnaire was completed by 256 Auckland science teachers regarding the inclusion of problem solving in their teaching programmes and their responses were used to structure a questionnaire for the four teachers involved in the first year of intervention. Other classroom handouts such as those detailing assessment of investigative work in year 12 biology programmes at City High were analysed. The researcher kept a diary over the period of intensive classroom visiting which included additional notes relating to the research context that arose from the researcher's reflection about the context and activities that had been observed. Results of mid-year assessment of investigative skills including photocopies of student work and copies of marking comments made by the teacher were analysed. Other documents accessed for information include the City High's participating students' sixth form (year 12) certificate grades for biology, the Education Review office assurance audit of City High and the report of a parental survey carried out by City High during the time of the research.

Issues associated with case study research

Walker (1974) identified some of the main problems of case study research as the degree of involvement of the researcher with the situations under study; confidentiality of the data; the possible political use of the data; issues of anonymity on publication; the need to clarify what is data and what is the researcher's interpretation of data. Issues I will address include the role of the observer and matters relating to validity, bias, and ethics.

- **Participant observation or observer participation within case study research**

The relationship between the researcher and the participating teachers and students is a significant aspect of research which takes place in regular school classrooms. The question as to whether the researcher is carrying out participant observation, or is acting as an observer who is participating, arises.

Participant observation requires a total involvement in the activities of the research situation whereas participation by an observer enables a looser connection by the researcher with the situation. Participant observation by an adult in a secondary school classroom presented a range of challenges both with regards to data gathering and the analysis of data (Ball, 1985). This was because the researcher was inevitably identified as an adult and thus conceptualised by the students as being “with the teachers”. This had the possibility of distortion of student accounts with students telling the researcher what they think the teachers will want them to say or, if they assume the information they give the researcher will be passed on to the teachers, what the teachers will want to hear.

To overcome this the researcher visited the classrooms and the wider school regularly during the two years of the study at City High. The researcher took a soft-line position as participant observer in that the need to be there as an observer was recognised but the researcher did not feel constrained to ‘share in the activities of the researched in a direct and complete way’ (Burgess, 1985: 25). The students and teachers were followed through their classroom interactions, with note taken of what they did, when, with whom, and under what circumstances, and the researcher queried them about the meaning of their actions. In this instance the researcher was therefore more of an observer who participated (demonstrator, teacher, helper, discussant) as required and requested by the students and teacher. Students frequently asked for help with equipment, report writing, definition of terminology, and even permission to leave the room - a request which was immediately redirected to the teacher.

In any situation where a researcher enters a classroom (literally or through a questionnaire) the teachers’ response will be mediated by the teacher’s past

experience of, and expectations with regard to, the researcher. The participant teachers in this research project had previously related to the researcher in a number of different roles - as a College of Education lecturer who frequently visited the school, biology teaching colleague, curriculum developer, regional and national Science Fair organiser and judge, conference presenter and senior Biology textbook author. It therefore was important to acknowledge possible power differentials in these relationships and to discuss these with the teachers.

The students saw the researcher as a person who had an interest in what they were thinking, something which they saw as different from their regular teacher's role. In time they began to approach the researcher to tell of some aspect of their work and their thinking that they thought might be of interest. Some indicated that they saw their research involvement as a welcome break from the everyday school routine. Sometimes the activity of the students placed the researcher in the teacher's role. At times the students would ask for help with their work - a request which was often deflected back to the teacher but at other times a discussion between the researcher and students ensued which elicited the students' thinking and thus generated data. It was possible that the more outgoing and outspoken students were more likely to share their thought and insights. As the students became familiar with the researcher's presence in the room and they became used to having their opinions asked, a response could be elicited from all of the students.

Feeding back research findings to the students promoted a richer response when their regular teacher absented herself and the researcher could talk directly to the students about what the data was showing. The students in the second year of the study, in particular, developed an easy relationship with the researcher, chatting and sharing aspects of their lives such as career aspirations, sporting activities, and their responses to other daily school tasks such as tests. Four of these students collected data when the researcher was not in the school - tape recording planning sessions for investigations and collecting worksheets.

- **Issues of validity for interpretivist case study research**

An interpretivist research methodology conceptualises the world being researched as socially constructed: both the researcher and the participating teachers construct their own knowledge and reality. Within a social construction of reality all knowledge claims are dependent on the 'process, assumptions, location, history and context of the knowing and the knower' (Altheide & Johnson, 1994: 499). If one holds this view of knowledge, then validity, Altheide and Johnson argue, depends on the readers of the research and the goals of the research and may be quite different for different audiences. However, they also identify four general criteria of quality for interpretive research: plausibility, credibility, relevance and importance of the topic. If a report is plausible and credible then its findings will appear convincing and probable. Its readers will find its findings acceptable and relevant, and its topic will appear to have considerable importance for their context. However there may be challenges to the validity of the findings from an interpretivist research methodology from other sources. These will be addressed next.

Interpretive research does not set out to 'test' a pre-conceived hypothesis but develops as an ongoing synthesis of observation and review of academic literature (Wainwright, 1997). When negotiated intervention sets the framework of the research directions, the data analysis and evaluation design is necessarily emergent rather than preset. The validity of the findings becomes dependent on the evaluator's expertise or educational connoisseurship (Eisner, 1979). The practice of reflexivity (Carr & Kemmis, 1986), involving a sceptical approach to the testimony of the participants and to the development of theory, can enhance the validity of both the synthesis of observation and review of academic literature and the design of the research.

Research whose goal is the revealing of the participants' views of reality (Lather, 1992), and which relies on descriptive approaches such as interviews and observation for much of its data gathering, may be considered by some to be less objective than other approaches (Borg et al, 1993). However, a totally objective viewpoint can only be gained if there is a high degree of detachment on the part of the researcher, a situation that may not be desirable if a researcher is to gain access to information

other than superficially. It is doubtful that data is ever totally objective. The researcher deliberately interacted with the participants in the study - allowing modification of data collection methods and a shared analysis and interpretation of the gathered data. In this research project relevant themes and patterns became the focus of more intensive or focussed observation or interview in later stages of data collection. The concern was with the validity of the information collected, whether it represented the genuine and carefully thought-through views of the person, rather than with the representativeness of the person's thinking to the general population of biology teachers. In the research report direct quotes were used to describe the 'individual's phenomenological reality' (Borg et al, 1993: 199). It was through these quotes that the individual's constructs of the events in the classroom context were expressed.

For interpretive researchers working with descriptive data, it is inappropriate to apply quantitative criteria of validity such as the number of the participants or the number of times the data is analysed by independent researchers. It is the quality of the insight from people who have a direct involvement that is important rather than the number of people who hold that view. The research report format both narrows and expands the focus so the analysis moves between specific observation and consideration of broader issues to make the research process more apparent and allow for validity to be more clearly assessed (Wainwright, 1997, from Hammersley & Atkinson, 1983).

Measures to increase validity of interpretive case study research findings

The validity of the methods and interpretations of this research project was strengthened through the gathering of data from multiple sources and by establishing a chain of evidence between interview questions and observations, and between the data collected and the conclusions drawn. The teacher participants reviewed the gathered information and had the opportunity to alter transcripts before analysis began, and discuss and respond to the data analyses as they were developing. The teachers did not significantly dispute the data analyses although rival explanations of the significance of data were explored together. The researcher kept a research diary that was both for self-reflection and a record of remembered incidents, and additional

information that came to hand outside of the classroom and interview situation. Careful records were kept and information regarding the procedures used to gain access to individuals or events was filed and the questions used to prompt semi-structured interviews are on record.

Triangulation of data

Triangulation methods were used where possible to ensure the accuracy of the developing story by deriving data from more than one source. Triangulation methods included confirmation of the data and data analysis by the participants (Hammersley & Gomm, 1997) and observation over an extended period of time. The extended and frequent observation of the participating teachers in addition to interview/questionnaire response addresses, to some extent, concerns related to ecological validity. That is, the problems arising from drawing inferences from what is expressed in interviews, to what people do in everyday life, when people are 'expected to behave differently according to context' (Hammersley & Atkinson, 1983: 10).

The direction and refining of the data analysis began with early discussion of the research questions with the research supervisors and participant teachers and continued throughout the reading of the written material and ongoing discussion. In this way the selection of data to observe became more focussed as the research questions became progressively redefined.

The classification of themes arising from the data analysis and the choice of quotations to illustrate them raises fundamental issues about the validity of the choice of the identified themes and the passages selected. There will remain concerns over whether the researcher has selected only those quotations that serve to illustrate their particular argument. To counter this accusation the participating teachers were asked to review all classroom and interview transcripts and to verify the narrative as it was developed for this thesis. Follow-up interviews of individual teachers and discussion at departmental meetings were also opportunities to check analysis, judgements and interpretations. Opportunities to check observations of students arose as they

interacted with the researcher in the classroom situation. In addition, the participating students in the second year of the research were interviewed in small groups at the end of the intervention phase, as were a group of twelve students from one of the other schools in the third year of the research. These interviews enabled questions relating to developing issues to be raised allowing for clarification and verification of interpretations. At times checking observations and judgement statements with the participants led to an enhancement of the data since discussions following querying of interpretations often provided more information.

Constant comparisons between multiple sources of data relating to common situations were also used for validation of data (Glaser & Strauss, 1967). As the investigations which formed part of the intervention were refined and again presented to students, the interpretations of observed data that directed the refinements were able to be checked. Changes to the wording of task sheets and teacher presentation techniques could be checked for increased clarity of instruction.

Long term and repeated observation enhances the validity of the interpretations (LeCompte & Goetz, 1982) by allowing for a comparison of data from different years and different students and teachers, that is time triangulation (Cohen & Manion, 1994). In addition the continued involvement of the early participating teachers over the following years enabled reflective checks of data over the three data collection years. One of the participant teachers in the first year was involved in the second intervention and another of the first year teachers was involved in the third year phase of the research. The long-term presence of the researcher in the school setting at City high has ecological validity implications, in particular from the perspective of the teachers. Whilst the teachers were involved over several years the students were largely 'new' to the situation with no students in the second cohort from the first cohort.

It is not possible to have total validity of the qualitative analysis of data arising from a social situation that is as complex as that of a school science laboratory. With Ball (1991) this researcher believes that we should 'expect different researchers to pick

their way through field work differently' (p167) as they struggle to find a way through the complexity of real world classrooms. This researcher agrees with others who view fieldwork and analysis within the qualitative domain as creative arts rather than as science (Woods, 1986).

Some ethical considerations

Science education case study research carried out in classrooms presents ethical problems for the researcher (Bell, 1992, Tobin, 1992). Questions such as 'Why are we doing the research?' and 'Whose story is it?' need to be asked and kept constantly in the frame of the data analysis. 'How reciprocal should the research be - how can the teachers and students gain from their involvement in this research?' (Bell, 1992, Brickhouse, 1992). The main ethical concerns are informed consent, confidentiality and potential harm to the participants. In the study I have been reporting here, ethical considerations and confidentiality issues were discussed with all participants prior to the intervention at each phase of the research.

To address the ethical concern of informed consent the general aims of the research project were discussed with the teachers prior to the beginning of the study and throughout renegotiation of the research direction. Permission to gather data in the schools was sought from the teachers, the Heads of Department: Science, the principals and the Board of Trustees of the schools. Students had the research questions and approaches carefully explained to them and were given the opportunity to withhold their individual data and worksheets. Anonymity was protected by the use of changed or coded school names and codes and/or personally selected pseudonyms for teachers and students (NZRE, 1981).

The question as to how much of the data to make public poses difficulties for a case study researcher where the number of participants is small and in an educational environment where there is an increasing emphasis on staff appraisal. There is a need to ensure that the research process or findings do not damage or harm any of the participating teachers or students (Bell, 1992). Such concerns have led to an awareness of the unethically of releasing data analyses into the public arena before

the participating teachers and students have had the chance to comment on them. In addition, Bell (1992) proposed that, to minimise any uncomfortable aspects of change, a researcher may have to become an adviser when requested, a role this researcher took when asked and which grew naturally out of genuine dialogue between the teachers and researcher. Such genuine reciprocal dialogue is the result of the active development of sound ethical relationships which are seen by Brickhouse (1992) as leading to an improvement in the quality of teaching, learning and research.

With respect to the question of what to publish there is 'not a general solution except one as may be dictated by the individual's conscience (Becker, 1964: 280). The procedures of participant confirmation of data analyses, a careful consideration of confidentiality issues, and protection of anonymity will, I trust, enable the findings from this research to contribute to the growing debate regarding the introduction of open investigations into a secondary school biology curriculum without causing the participants any harm.

Conclusion

In this paper I have outlined the variable aspects of case study research which determine its many shapes or faces. A case study approach demands a variety of data gathering approaches, both quantitative and qualitative, in order to build up a rich picture of the case under study. Issues related to case study research have been identified as the degree of involvement of the researcher with the situation under study, confidentiality of the data, the possible political use of the data, issues of anonymity on publication and the need to clarify what is data and what is the researcher's interpretation of the data. Issues of validity, selectivity and ethicality in case study research have also been identified.

Comments welcome

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