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EDITED BY JOHN A BOWDEN AND ELEANOR WALSH

Phenomenography

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Contents

PREFACE

Since the early 1970s, when Ference Marton and his colleagues Roger Säljö, Lars-Öwe Dahlgren and Lennart Svensson undertook the pioneering work which led to the establishment of phenomenography, a large number of academics around the world have become interested in their way of doing research. Many have adopted phenomenographic methods in their own work and often, as in my own case, this has begun through personal interaction with an experienced phenomenographer.

Both a study of articles and reports published about phenomenographic research, and less formal communications at conferences and educational meetings, make it clear that there are considerable variations in the methods used by different phenomenographic researchers and even by the same researcher in several investigations.

In order to consider those variations in method more carefully, the Warburton Symposium was arranged during Winter, 1991. This two-day, intensive meeting was modelled on the Marysville Symposium held in Spring, 1985. The latter focused on the relation between educational research and educational development and resulted in the publication of *Student Learning: Research into Practice* which I edited.

All the papers in the present monograph have been written by experienced phenomenographers. Some were first written for the Warburton Symposium. All of those have been subsequently revised at various times since but five of them (Chapters 2, 3, 4, 6 and 7) are presented in this monograph in their 1993 form. Chapters 1 and 5 have been revised for this publication and 8 and 9 are new.

Should the fact that some of the chapters represent ideas written about in 1993 concern the reader? I suggest not. The purpose of this monograph is to expose postgraduate research students to different ways of seeing phenomenographic research. The contributions by different authors at different times provide the variation that will help readers to find their own best method for their particular research questions. That a particular phenomenographer might have developed their way of seeing phenomenography since the chapter was written does not detract from the value of reading the earlier accounts. The aim is to expose readers to different ideas, not to indoctrinate

them into the latest preferred approach. For example, Chapter 4 describes phenomenographic research activities for a project not at that time completed. The dilemmas, the puzzles, the difficulties and the feelings are all described in a context in which the final outcome is unknown. To have updated that chapter by revealing the (now) known outcomes and using hindsight to tidy up what was written in 1993 would be to miss the point of this monograph. Readers need to approach such chapters as a means of revealing something of the way people have approached particular research problems and to consider what they might do should they find themselves in a similar situation at some time in the future.

This monograph could be analysed against the characteristics suggested in the Preface in *Action Research*.

First of all, the authors are intended to be people who have had extensive experience is using the research methods being discussed. This is true of all the authors, including Dunkin and Patrick who used phenomenography as their principal method for their PhD research.

Secondly, the descriptions of what the research method is about and how the researcher uses the research method are meant to have a 'warts and all' feel about them. Both Dunkin and Patrick query the established method and in the other chapters, the pros *and* cons are openly discussed; as well some of the difficulties in undertaking the research are highlighted—including the 'pain' of doing qualitative research (see Chapter 4)

Thirdly, there is much use of the first person in the prose, along with descriptions of how it 'feels' to do research in this way

Finally, this monograph includes accounts by recent postgraduate students (Dunkin and Patrick) who discuss why they chose their particular research method and how it worked for their thesis topic.

Chapter 1 of this monograph is reprinted from John Bowden: 'Phenomenographic research: some methodological issues', *Nordisk Pedagogik*, 1995, vol. 15, no.3, pp 144–155, following some modifications.

Thanks must go other participants in the Warburton Symoposium—Carol Bond, Norman Eizenberg, Alistair Inglis, Nancy Law, Elaine Martin, John Milton and Paul Ramsden—whose generous contributions led to useful revisions of the original papers.

John A Bowden
January 2000

CHAPTER ONE

The nature of phenomenographic research

John A Bowden

Introduction

Critics of phenomenographic research allude to its perceived lack of validity, its lack of predictive power, its researcher bias and its denial of the voice of the individual through categorisation. I believe these criticisms derive from ambiguities in perspective and action evident among phenomenographers themselves, both within their own work and between different researchers. In discussing these aspects of phenomenography, I have found the work of Ference Marton (1986), Hazel Francis (1993), Säljö (1994) and Sandberg (in press) helpful.

Francis—who is not a phenomenographer—makes many useful comments on methodological issues and her 1993 paper is particularly insightful and challenging to phenomenographic researchers. However, some of her assumptions are questionable. These assumptions have to do with (1) the object of investigation in phenomenographic research, (2) the distinction between the research methods and the theory of learning within phenomenography, and (3) the relation between the individual conception and the categories of description which emerge from phenomenographic research

Phenomenographic research methods of data collection and analysis can be used to study a range of issues, including approaches to learning, approaches to teaching, understanding of scientific phenomena learned in school, or understanding of general issues in society unrelated to educational systems. Francis (1993) appears to have inferred that phenomenographic research is always about studies of learning. Certainly, the roots of phenomenographic research methods are to be found in studies of learning (Marton & Säljö 1976) but the methods may be, and are, applied to a variety of other issues, both inside and outside the field of education.

Secondly, Francis does not distinguish between the research methods and the broader theoretical base of phenomenography.

However, the distinction is important. The outcomes of phenomenographic research are often subsequently dealt with within the broad phenomenographic framework which has, as its base, a characteristic theory of learning. However, this is not the only possible application; the research outcomes may subsequently be used within a quite different framework. Where the phenomenographic research activity begins and ends is a question this chapter takes up later.

Thirdly, Francis (1993, p. 73) refers to the aim of phenomenography as that of being able 'to use samples of conceptions to construct categories . . . it is necessary to show that across the selected sample of individuals the sampling of conceptions has been achieved'. This view implies that individual conceptions are directly available and that they are somehow blended to form the categories of description. This is problematic and I shall discuss it towards the end of the chapter. The first question is What is phenomenographic research?

What is phenomenographic research?

Few articles on phenomenographic research give details of the research method. Often a brief overview of method suffices with reference to detail elsewhere such as, for example, Marton (1986) where he says:

> Phenomenography is a research method adapted for mapping the qualitatively different ways in which people experience, conceptualise, perceive, and understand various aspects of, and phenomena in, the world around them (p. 31).

These words are probably the most quoted in phenomenography, and I often cite them. Marton goes on to describe in more concrete terms how phenomenographic research is carried out. While that description depicts a sequence of actions whose spirit fits with what I personally do as a phenomenographic researcher, the detail departs from my practice. Later I discuss various aspects of Marton's description and compare our practices.

Does the variation in practice really matter? In the past I have seen the variation as unremarkable within the context of a shared philosophy, with little need for examination or exploration. Indeed, Ference Marton was a guest member of our research group when I was learning how to undertake phenomenographic analysis of interview transcripts. But I have come to think that there are differences which matter and which need to be identified and explained. In asserting

this, I am not arguing that one approach is right and the other wrong, or that one is phenomenographic and the other not. One can allow that there are variations in method and that a description of the variations in method would be an apt pursuit for phenomenographers.

However, given that phenomenography is becoming more popular and is coming under more scrutiny from researchers from other paradigms, the differences in procedure and argument, and their validity and reliability in particular circumstances, need spelling out.

A developmental or a pure phenomenographic interest? Are there methodological implications?

I want to contrast what I would call developmental phenomenography and what Marton calls a 'pure' phenomenographic interest. By 'pure' he means describing how people conceive of various aspects of their reality, where the concepts under study are mostly phenomena confronted by subjects in everyday life rather than course material studied in school (Marton 1986, p. 38).

In contrast, my phenomenographic research is developmental and it has a particular kind of context. It seeks to find out how people experience some aspect of their world, and then to enable them or others to change the way their world operates, and it usually takes place in a formal educational setting. My reasons for undertaking the research are to use the findings to affect the world I live and work in. The research findings are not the objective per se. The difference between this developmental notion of phenomenographic research and Marton's 'pure' phenonemnography reminds me of Säljö's contrast between earlier and more recent approaches:

> . . . what appears to be lost in the 'pure' phenomenographic interest, was the notion of people as hermeneutic beings making sense of what they see, hear and read. Thus to read a particular text and to interpret it roughly as it was intended under specific social and communicative constraints, is to attempt to achieve something. . . . What the studies were about, thus, in a sense had to do with how people as cultural beings decipher and render meaningful messages mediated through writing (Säljö 1994, p. 73).

I argue then, that 'pure' phenomenograpy differs from what I have called developmental phenomenography, along the lines that Säljö describes.

For example, a developmental project that I have been involved in since 1988, is investigating students' understanding of fundamental physics concepts (see chapter 4). Publications on the project include Bowden et al. (1992), Dall'Alba et al. (1993), Walsh et al. (1993), and Ramsden et al. (1993). These deal with various aspects of the project, including the relation between students' understandings and textbooks' treatment of acceleration, or implications for physics teaching and assessment of a range of studies of students' understandings of the concept, frame of reference.

Our aim in this research was to provide findings which could then be used in teaching and learning physics and in other teaching and learning contexts. Thus we needed to interview people who had studied physics so that we could use the research outcomes to comment on textbook treatments of the physics phenomena under scrutiny, and on the way in which physics students are taught and assessed. If we had interviewed people who had never studied physics the research results would have been regarded by science educators as irrelevant to the pedagogical issues. Moreover, it was vital that the interviewees had studied physics in the particular educational system under scrutiny.

If you take this line, it is clear that particular methods used in developmental phenomenography are affected both by the intended use of the research outcomes and by the internal requirements of phenomenographic research per se. It may be that the same limitations do not apply to 'pure' phenomenography. However, I think that they do and that is an issue which deserves further exploration.

The research that I do is developmental in that it is undertaken with the purpose of using the outcomes to help the subjects of the research, usually students, or others like them to learn. The insights from the research outcomes can help in the planning of learning experiences which will lead students to a more powerful understanding of the phenomenon under study, and of other similar phenomena. The outcomes from these research studies can also be used to develop generalisations about ways to organise learning experiences in the particular field of study. The research outcomes and the way they are obtained can also be used more generally—as an analogy—in programmes for teachers, to demonstrate ideas about teaching and learning. The focus of the research is therefore as much on the subjects of the study and on the nature of the data collection process which triggers their contribution, as it is on the phenomenon under study. In every sense the research is relational, and thus the full range of methodological issues becomes important.

Two examples from the study of students' understanding of physics concepts referred to earlier are relevant. In one (Bowden et al. 1992), the project team compared students' ways of seeing a number of similar phenomena concerned with the concepts of displacement, velocity and frames of reference. An initial, written question involving these concepts was presented to individual students who were each asked to talk about it in a phenomenographic interview. The questions were quite different in form, two being entirely qualitative while the other two provided quantitative data, for which there was a numerical solution. The outcomes from the four cases were compared, the differences among them were noted and implications for teaching these concepts to students at the end of high school and the first year of university were explored. That the students in the study were from that same population was vital to the research, just as the precise nature of the question in each case was significant. What went on in the interviews was also important; that there were particular interventions that were planned to be made and those that it was decided should not be made were equally relevant. Here there are important issues of validity and reliability which go beyond the question of whether the categories of description are reproducible and truly represent the way the interviewees see the phenomenon. This raises the question of when the phenomenographic research process actually begins and ends, a question I take up later.

In another study (Dall'Alba et al. 1993), our project team explored students' understandings of the concept of acceleration and compared the findings with the ways in which textbooks treated this concept. Some less powerful understandings that some of the interviewees displayed were related to the textbook treatment. The textbooks chosen for analysis were those that the interviewees had used in their high school and university courses. Thus it mattered who our interviewees were and what their previous learning experiences had been.

These examples demonstrate that in carrying out developmental phenomenography it is important that the studies, like any research, be planned and managed from beginning to end if the purposes are to be achieved. Analysis of opportunity data is unlikely to achieve the developmental purposes described above.

What about non-developmental research? Research which focuses on the phenomenon under study per se and where the ultimate goal is to develop full descriptions of the range of ways of experiencing that phenomenon, with no intention of using those outcomes to effect change? In this 'pure phenomenographic' research, is

there less need to focus on aspects of methodology which I have suggested a developmental phenomenographic perspective demands? I believe the same demands apply to pure phenomenographic research and that those who engage in the research need, at the very least, to consider the question further.

Research Method

In this chapter, the focus is on studies which analyse transcripts of phenomenographic interviews. The physics project referred to earlier is used as an example in this section. While questions of reliability and validity cannot be totally separated, the issues discussed in this section relate more to validity. The question of reliability in phenomenographic research is addressed comprehensively by Sandberg (1995) who suggests reliability as interpretative awareness is more appropriate than reliability as replicability.

Like other researchers, phenomenographers need to be clear about the purpose of their studies and the strategies by which they will achieve the ends they are interested in. All the research should refer back to those intentions. Francis picks up this spirit when she says of the interview:

> In thus describing the nature of the phenomenographic interview, Marton has drawn attention both to its inter subjectivity and to its [sic] not being simply a social construction but one with a particular aim. This emphasis on purpose is important . . . (Francis 1993, p. 71).

Like all research, a phenomenographic research study needs to have a coherent method, and to be well planned and managed from beginning to end. Figure 1 illustrates this process. It should begin with a clear intention; the research should be planned around a particular purpose; that purpose should provide a focus through the whole study and guide action.

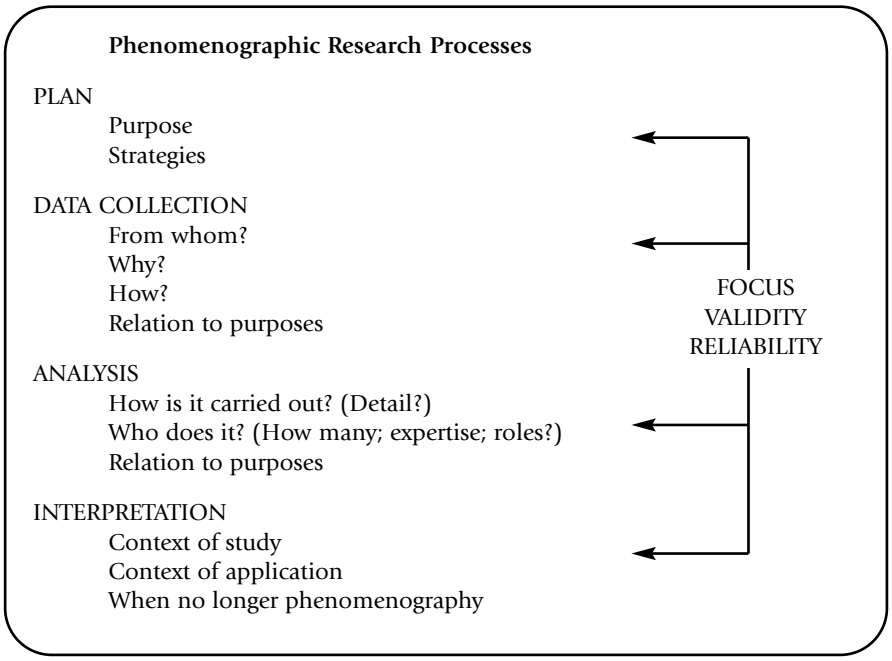

Figure 1

Planning — purposes and strategies

Whatever research method is used, researchers need to articulate the purposes of their project and to keep those purposes in mind at all stages of the research—in the design of the investigation, in the development of the data collection processes, in the collection of data and in the analysis and interpretation. This applies as much to phenomenographic research as to any other.

Thus the physics study was undertaken because later year students in a university physics course were having difficulty with advanced study despite having performed very well in physics examinations in the final year of school and the first year of university. The underlying purpose for the whole study was to make sense of students' understanding of the physics concepts in the context of their educational experience. This purpose affected every action taken to complete the study. (In the event, emphasis in examinations on solving quantitative problems at the expense of demonstrating qualitative understanding (see Bowden et al. 1992) provided much of the explanation of the students' difficulties in understanding physics at an advanced level.)

Given that purpose, our project team planned to invite students with relevant backgrounds in physics to demonstrate their understandings of particular physics concepts, and to analyse the relationships between their understandings and their educational experience. The study focused on those concepts which had provoked the study in the first place.

Data was collected by interviewing students on how they went about solving particular physics problems, each problem being approached through one of the study's key concepts. The research plan included a pilot stage which tested and refined data collection procedures. This is one of the strategies Francis (1993, p. 71) advocates.

In the choice of interviewees, in the concepts to be explored, in the nature of the questions and in the way the interviews were carried out, the primary purpose of the study was kept in mind. There was a single focus running through the whole investigation. Would we be able to relate the categories of description to students' learning experiences? This would only be possible if we knew who the interviewees were, what their learning experiences in physics had been, and whether they had an educational background similar to those students whose problems sparked the study.

Phenomenographic interviews

Phenomenographic interviews usually begin with interviewees being asked to respond to a planned question or a given situation. Two common types of question are (i) problem questions in the field under study, and (ii) questions of the 'what is X?' kind. In the first category, the questions which focus the interview are usually open-ended so as to allow the interviewees to decide on those aspects of the question which appear most relevant to them. The interviewees' approaches to the question and the aspects they choose to consider are of relevance in the analysis of the transcripts. From the researcher's point of view, the questions are designed to be diagnostic, to reveal the different ways of understanding the phenomenon within that context.

Phenomena organised around 'what is X?' questions tend to work against this intention. In our project, we avoided such questions altogether; sometimes the question didn't mention 'X' at all. Some of the problem questions in our physics project were focused on concepts such as terminal velocity or frames of reference, without those concepts being explicitly asked about or even referred to. Those concepts underpin the specific problems posed but were often not explicitly addressed in the problem presentation.

Säljö suggests that by posing problems or by referring to shared topics of discourse, there is more likelihood of establishing a joint definition of what is being talked about between the researcher and the interviewee; in discussing this he cites our study (Ramsden et al. 1993) and also Marton, Dall'Alba & Beaty's (1993).

Whom to interview and why?

It is important that the interviewees from whom the data are collected are appropriate to the purpose of the research. In the physics project, we decided that the subjects to be interviewed should represent a cross-section of physics students in final year of school and first year of university; this was not to ensure statistical rigour but to maximise the range of perspectives encountered and to ensure that we interviewed students who had had similar educational experiences to those whose understandings of physics had provoked the study. We collected data from both male and female students and from students across the full range of ability groups in a variety of school types.

How to interview

Marton gives a clear indication of the kinds of conversation that take place in a phenomenographic interview:

> . . . interviewing has been the primary method of phenomenographic data collection. What questions are asked and how we ask questions, of course, are highly important aspects of the method. For present purposes it will suffice to say that we used questions that are as open-ended as possible in order to let the subjects choose the dimensions of the question they want to answer. The dimensions they choose are an important source of data because they reveal an aspect of the individual's relevance structure. Furthermore, though we have a set of questions at the start of the interview, different interviews may follow somewhat different courses (Marton 1986, p. 42).

In this way, interviewees are encouraged to reveal, through discussion, their ways of understanding a phenomenon, that is, to disclose their relationship to the phenomenon under consideration. The phenomenographic interview has a focus—the way in which interviewees understand the chosen concept—and this focus is maintained throughout the interview. Interviewees are encouraged to

express their qualitative understanding of the phenomenon under investigation. The researcher may ask interviewees to clarify what they have said, and ask them to explain their meaning further using questions such as 'Could you explain that further?', 'What do you mean by that?', 'Is there anything else you would like to say about this problem?' (Bowden et al. 1992). Such questions aim to get interviewees to reflect on what they have expressed, to explain their understanding more fully and to reveal their way of understanding the phenomenon.

Other phenomenographers may engage in more extensive dialogue during the interview. I have concerns where this goes beyond what the interviewee has already introduced into the conversation since it introduces, in an unplanned way, the researcher's ideas about the phenomenon. But pointing out to interviewees and asking them to comment on the apparent inconsistency between ideas they have expressed at different points in the interview is consistent with the principle of interviewing that I have outlined. In the physics project, we initially presented the phenomenon to all of the subjects in precisely the same way; we used a limited set of planned questions to cover any new ideas that might be introduced during the interview, and all other questions were focused solely on encouraging the subjects to explain *their* ideas as fully as possible. It was only in this last aspect that the interviews differed markedly, as directed by the subjects' ways of seeing the phenomenon. This appears consistent with Francis's (1993, p. 71) suggestions of planning interviews with prompt trails.

How to analyse

The way in which we analysed the transcript data in the physics project is best illustrated by a further quote:

> All interviews were transcribed and the transcripts subjected to rigorous phenomenographic analysis. This involved one member of the research team taking the responsibility for reading all transcripts related to a given question and devising a draft set of categories of description drawn from the transcripts. That researcher then re-read the transcripts and made tentative allocations of each transcript to one of the draft categories. The other researchers carried out the latter task independently. The allocations of transcripts to categories were compared. Where there were disagreements about category descriptions or allocation of transcripts, they were resolved

> with reference to the transcripts as the only evidence of students' understandings. The focus was on the student's meaning, taking the transcript as a whole, rather than on the occurrence of particular statements corresponding to a specific category description. An iterative process was used to produce final descriptions that reflected the similarity in understanding among the transcripts allocated to each category and the differences between the categories (Bowden et al. 1992, pp. 263–4).

Chapter 4 provides more detail about our approach. Persual of Ference Marton's account of phenomenographic analysis below will show up similarities with our approach, but also some differences. They tend to be differences of focus but they are important variations:

> . . . The first phase of the analysis is a kind of selection procedure based on criteria of relevance. Utterances found to be of interest for the question being investigated . . . are selected and marked. The meaning of an utterance occasionally lies in the utterance itself, but in general the interpretation must be made in relation to the context from which the utterance was taken. . . . The phenomenon in question is narrowed down to and interpreted in terms of selected quotes from all the interviews. Of course the quotes themselves are interpreted and classified in terms of the contexts from which they are taken.
>
> The selected quotes make up the data pool which forms the basis for the next and crucial step in the analysis. The researcher's attention is now shifted from the individual subjects (ie from the interviews from which the quotes were abstracted) to the meaning embedded in the quotes themselves. The boundaries separating individuals are abandoned and interest focused on the 'pool of meanings' discovered in the data. Thus each quote has two contexts in relation to which it has been interpreted: first the interview from which it was taken and second the 'pool of meanings' to which it belongs. The interpretation is an interactive procedure which reverberates between these two contexts. A step-by-step differentiation is made within the pool of meanings. As a result of the interpretative work, utterances are brought together into categories on the basis of their similarities. Categories are differentiated from one another in terms of their differences. In concrete terms, the process looks like this: quotes are sorted into piles, borderline

> cases are examined, and eventually criterion attributes for each group are made explicit. In this way, the group of quotes are arranged and re-arranged, are narrowed into categories and finally are defined in terms of core meanings, on the one hand, and borderline cases on the other. Each category is illustrated by quotes from the data (Marton 1986, pp. 42–3).

In our analysis, the team did not extract 'selected quotes' and deal with them separately from the interviews from which they came. Indeed, Marton alerts us to the importance of keeping in mind the context from which the utterances come. But I see that as being very difficult to do if a cut-and-paste construction of the pool of meanings is undertaken. I prefer to deal with the whole transcript all of the time. I look at any particular utterance in the context of what is said in the rest of the transcript. This is not to assert that the 'pool of meanings' approach to analysis cannot produce appropriate categories of description. However, I do believe such de-contextualisation makes the task more difficult and is a methodological variant which is at odds with the underlying relational nature of phenomenography. It may be argued that the contextual nature of the selected quotes is dealt with subsequently, but in my view it is better to avoid the potential problems from the beginning. This position is consistent with Roger Säljö's (1994, p. 74) critique of phenomenography: 'When the communicative context and the very motive for engaging in a particular task are lost as a focal background for understanding what people do, the exercises risk becoming abstract'.

In a later paper, Marton (1992) describes the method in a more open-ended way as follows: '. . . the analysis boils down to identifying and grouping expressed ways of experiencing the phenomenon (literally or metaphorically making excerpts from the interviews and putting them into piles)'. However the same potential for de-contextualisation remains and would be particularly problematic for the novice researcher.

As in all other parts of the research, the same focus which guided the interview should apply to the analysis of the transcripts. It is not an easy task and, in chapter 4, I describe the difficulties of phenomenographic analysis. Marton describes it thus:

> An important difference between (phenomenographic analysis) and traditional content analysis is that, in the latter case, the categories into which the utterances are sorted are determined in advance . . . the (phenomenographic) process is tedious, time-

> consuming, labour-intensive, and interactive. It entails the continual sorting of data . . . definitions for categories are tested against the data, adjusted, retested, and adjusted again. There is however a decreasing rate of change and eventually the whole system of meanings is stabilised (Marton 1986, p. 42).

As phenomenographic researchers, we have to allow that some of these meanings might not be of a kind that we would predict or even credit as being reasonable; many would be but some might not be. Some understandings that we might expect to observe might not emerge as anticipated.

In chapter 2, Eleanor Walsh has more to say on phenomenographic analysis when she discusses the following questions:

- Who are the people doing the analysis, what expertise do they have, and is there one researcher or many?
- What sort of expertise do the researchers have with respect to phenomenographic processes, and with respect to the discipline under study?
- Is it valid for a research assistant to be trained for the task of conducting the phenomenographic interview, to be asked to collect the data, and then to derive categories from the data?
- What kind of training should be given to a research assistant for the analytical task? What prior experience of the content of the questions should the research assistant have? (Equally, should undertaking a phenomenographic study be regarded as a valid task for a post-graduate student?);
- Is analysis necessarily a group process of extended length and complexity, involving a number of people not just one individual, where different researchers bring particular expertise to the task?

Where does phenomenographic research begin, where does it end?

From my view of phenomenographic research above, the reader would be correct in inferring that I favour phenomenographic research studies which are planned in such a way that all relevant aspects of the research are undertaken from a phenomenographic perspective. A reasonable question to ask would be, what do I make of research studies that examine historical data phenomenographically,

or that involve a phenomenographic analysis of interview data gathered previously by other researchers for different purposes?

I would view such studies as examples of a certain aspect of phenomenographic research, in this case, phenomenographic analysis, but not as examples of full phenomenographic studies. I also think that any publications arising from such research should make it clear that phenomenographic analytical methods have been applied to data collected for another purpose, that is, that the phenomenographic aspect of the research begins with the analysis. Those distinctions are often not made and that is confusing, especially to those inexperienced in phenomenographic research. It can lead to misinterpretations of phenomenographic method, to false criticisms of phenomenography and to readers who model their own research on incomplete understandings.

I have emphasised the purposeful nature of the phenomenographic research I have undertaken with my colleagues: its developmental intentions. But I also want to make clear my view that once the final categories of description are determined the phenomenographic research process per se has ended. What is done with the research outcomes becomes subject to the accepted practices of the field of application; in our case, this is science education. In many phenomenographic research studies of course, particularly those investigating approaches to learning, the field of application is also phenomenographic, so that the research method and the application form a seamless link. This is the kind of relationship which Marton is referring to, in a section headed 'educational applications of phenomenography', when he says:

> In a way, we cannot speak of the educational applications of phenomenography, because the method was not developed separately from education and then applied to the field. Phenomenography was developed in response to educational questions (Marton 1986, p. 44).

That may be so but it should be acknowledged that there are researchers who take the categories of description out of the interpretative paradigm in which phenomenography sits and into another; such researchers need to take account of the procedures and accepted practices of that second paradigm. In these cases, it is the development of the categories of description that is phenomenographic; their subsequent use may not be. In a sense, the development of the categories of description represents a decision point for the researcher,

one which should be acknowledged. The seamless link referred to above should not be simply assumed to exist.

Conceptions and categories of description

There is a wide variation in the use of the term 'conception' amongst phenomenographers. Francis's (1993, p. 70) use of the heading 'obtaining individuals' conceptions' implies a belief that the phenomenographic method allows the researcher to obtain the 'individual conception' and that this may be done by an inspection of the data, that is, an interview transcript.

In my view, Francis's interpretation is problematic. Phenomenographic research seeks to describe the major features of the different ways a group of people relate to a phenomenon. This analysis necessarily includes some input from the researchers and is feasible only by examining data from a number of individuals. As an outcome, there may be a particular category of description to which only one transcript is assigned, and it could be argued that that category of description should be thought of in terms of the particular individual's conception of the phenomenon. The problem with this view is that the identification of that category of description does not come simply from the communication between the researcher and that one individual; in phenomenographic research, a particular category of description is always developed through its relation to a number of people's categories of description.

Sandberg (1995) describes the relation between individual conceptions and categories of description in a way that corresponds to my understanding of it. He suggests that in the phenomenographic approach, the term 'conception' is used to refer to people's ways of experiencing a specific aspect of reality and that conceptions (note the plural):

> are typically presented in the form of categories of description. The basic idea of the phenomenographic approach, then, is to identify and describe individuals' conceptions of some sort of reality as faithfully as possible . . . the more faithful we, as researchers, can be to individuals' conceptions of an aspect of reality, the better we are able to understand learning, teaching and other kinds of human action within society (Sandberg 1995, p. 157).

My agreement with Sandberg's representation stems in part from his use of the phrase 'as faithfully as possible' which indicates a dis-

tinction between the categories and the conceptions. My concern about terminology is that, in the literature, the terms 'conception' and 'category of description' are often used interchangeably.

A common criticism of phenomenography is that the researcher purports to categorise an individual conception with a description that denies the individual his or her voice. Beneath that criticism is an understanding of the individual conception as being relational (between the individual and the phenomenon) but also unavailable to the researcher in the way it is available to the individual herself or himself. In my view, the phenomenographic objective of describing the different ways of seeing a phenomenon has a pragmatic perspective. Certainly in my research, I am interested in finding the limited number of ways of seeing that can be usefully differentiated so that the descriptions can be used for some other (educational) purpose. I don't wish to assert that I 'know' an individual's conception of a phenomenon. What I do want to be able to say is that, following a given interview context, analysis of the transcripts enables me to differentiate between a number of different ways of seeing the phenomenon that are apparent in that kind of conversation. If only one transcript is assigned to a particular category of description, I don't wish to assert that that is the individual's conception of the phenomenon in any absolute sense. The person's conception of the phenomenon is unlikely to be stable: it may vary with time and context. Also, it is not possible for the researcher to 'be' that person; the researcher interprets the communication with the person.

This is still consistent with Sandberg's notion of fidelity to the individual's conceptions. The categories of description should as faithful as possible to the individual's conceptions but without being claimed to be equivalent to them, as would be implied by the use of the term 'conception' when referring to a category of description. In discussing the relation between conceptions and categories of description, Säljö (1994) refers to Marton and Svensson's view (1985, p. 249) that categories of description 'denote' conceptions. Säljö is critical of that view since it implies that categories of description:

> point to another level of description. In reading the texts produced in this tradition, we find that the conceptions should not be seen as pointing towards some kind of processing mechanism, rather they are ways of construing and structuring reality that obviously can be triggered through interviews (Säljö 1994, p. 75).

I would not use the term 'conception' as Säljö does. It can be seen from the above that I agree with Johansson et al. (1985) who claimed that a 'conception is not visible but remains tacit, implicit, or assumed' (p. 236). I am satisfied that phenomenographic research produces descriptions which owe their content both to the relation between the individuals and the phenomenon (that is, their conceptions) and also to the nature of the conversation between the researcher and each individual and its context (which includes the relation between the researcher and the phenomenon). To my mind, it adds unnecessary complication and ambiguity to also refer to those descriptions as conceptions. It should be noted that in chapter 4, which was written in the early 90s, I used the term 'conception' in ways that I now criticise. I now believe that the term 'conception' is being used very loosely and that its misuse in phenomenographic literature warrants further attention.

Conclusion

This chapter presents an idiosyncratic view of phenomenographic research. That view must relate in some way to my experience as a researcher, which began in natural science. So it is likely that there will be many phenomenographers who disagree with the points I have made. However, I believe that the matters I have discussed are worthy of further debate and look forward to it.

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CHAPTER 2

Phenomenographic analysis of interview transcripts

Eleanor Walsh

This chapter considers major issues in phenomenographic analysis which were raised at the 1991 Warburton Symposium. The issues concern the way in which categories of description are arrived at, the nature of the relationship between categories, the need for a group process rather than the individual to determine the categories in the data, and the role of research assistants and postgraduate students in the collection and analysis of data. Quotations in the text are from the symposium discussion sessions, unless otherwise stated.

Constructing or discovering categories?

Other authors in this monograph (see chapters 1, and 3–6) have described their practices in undertaking phenomenographic research: all report on research using interviews. Phenomenographic data may be obtained by various methods but the interview is the most common. In this chapter, I shall assume that the data to which speakers refer are from interview transcripts.

The style of the phenomenographic interview is non-directive with one exception: this occurs when the interviewer 'leads' the interviewee to focus on some predetermined content in a particular context (Bowden et al. 1992, Francis 1993). As Francis (1993, p. 7) puts it: 'some pre-determined leading experiences and leading prompts are required to focus the interview appropriately for the aims of the study in question'.

The interview data (transcripts) are then analysed and the categories of description are obtained. As chapters 1 and 3–6 suggest, researchers differ in their approaches to analysing interviews. Are all approaches equally valid, equally effective, equally reliable? Will different approaches produce different 'results' from the 'same set' of transcript data? In the symposium these issues led to questions about the nature of the process used in obtaining the set of categories. It was

suggested that 'this is an issue . . . much broader than phenomenography . . . it is a question in basically all kinds of qualitative research'.

These are the questions. Are the categories already present in, and constitutive of the data, so that the purpose of phenomenographic analysis is to allow the categories to emerge progressively as the analysis proceeds? Or, are they a construction which the researcher imposes? Or is the nature of the process different again?:

> When we started doing this research we had very much the attitude . . . the maximum open-mindedness and [we were] trying to see what the students see and, in a way, this is a programme of phenomenology as well . . . to bracket all your preconceived ideas . . . to see what presents itself. . . . Just as in phenomenology there has been this idea that has been subject to criticism . . . is it possible to come to anything without preconceived ideas? After all, if you forget everything you know about the world, you wouldn't be able to make sense [of] . . . anything that people are saying.

Phenomenographic analysis—whether it is seen as construction or discovery—focuses on the relationship between the interviewee and the phenomenon as the transcripts reveal it. But is the researcher consciously interpreting the data, choosing and discarding data, and thereby constructing the relationship? Or is the researcher looking into the transcripts to discover the particular ways in which people understand the phenomenon? Francis (see chapter 1) is among those who believe the process of arriving at the categories is one of discovery: 'Phenomenographic studies aim specifically to discover categories from the data, not to analyse [it] in terms of predetermined classifications.' The question then arises: what are the major differences between a process of construction and a process of discovery?

Constructing categories?

Those who see the 'data's' categories as constructed hold that the categories emerge from the relationship between the data and the researcher. The raw data represent the relationships between the phenomenon and the interviewee as he or she describes their experience of the phenomenon. The researcher then draws on his or her particular perspective to describe the relationship the interviewee has to the phenomenon: the researcher's perspective influences the categories 'in' the data.

A process of construction implies that the researcher follows certain procedures, observes certain principles, and has a sense of control over the data; and that where the data conflicts with the expert's or the researcher's preferred framework, the framework, rather than the data, will take precedence in developing a description:

> You wanted to specify a method of how to explore experiences of the world. Now, in most research you would try to develop an understanding of the phenomena and . . . a theory of the phenomena and you can . . . specify that this is what conceptions look like. This will give you a guideline of how and what to look for.
>
> . . . it seems to me we construct the categories. The categories we get are a function of the methodology as well as the data. . . .The categories don't exist independent of the methodology that we use and so we construct a logically related set of categories.

The idea of constructing categories suggests that the researcher has a better grasp of the world than the interviewee, and it presupposes the need for the categories to fit some predetermined framework. But attempting to get a set of categories that is logically related implies that the researcher should adjust and restructure the categories in order to represent the data faithfully and to produce a set that fits some preferred pattern. For example, researchers might seek a set of categories in which a higher level category encapsulates and extends lower level categories. Inevitably, there is tension between being true to the data and at the same time creating, as the researcher sees it, a tidy construction which is useful for some further explanatory or educational purpose:

> The way I've done it . . . is that if I've found a category that doesn't seem to fit the structure I've then had to revise the structure or revise the category in a way so that I set out to construct a logically related set of categories and the categories I get are [in] . . . both the data and the methodology.
>
> I wondered whether . . . the categories that I'd constructed weren't appropriate. Then I'd iterate through looking at that and revise maybe the categories or maybe the categorisation of some of them [the transcripts] if I felt it was justified.

Some see it as valid to omit some categories that emerge from the data and to discount others:

> When I've gone about it to try and get a set of categories that are logically related I've seen my role as a constructing these categories in a sense. To get them logically related, I've got to adjust the categories and restructure them and I'm the one that's restructuring them to try and get this set of logically-related categories that most closely matches the data

The contrary view is that all the data should be used, even if the result is untidy so that, for example, the results do not have a logical structure. Additionally, content experts (those who have the accepted view of the phenomenon) might have difficulty in accepting some of the ways the phenomenon is understood by non-experts:

> When you're talking about students discussing physics phenomena and they say something which is different from, and difficult to relate logically to the other conceptions which you develop from the other transcripts, it seems to me that if you're implying that one discards that because it doesn't fit into this neat logical structure, then I find that difficult to accept.

However, constructing descriptive categories implies reliance on the researcher's input and framework, and the categories are seen as:

> a relationship between the data and the researcher. They're not in the data as such. The categories don't exist independently of the person who's doing the analysis.
>
> I wouldn't impose it [the set of categories]. I would pick the categories as some sort of relationship between the transcript and the way I've gone about constructing them. So it's not a predetermined category system of mine but then again I don't think I can see what the students are saying . . . I don't think I could look at a transcript and say 'Oh that's what the students have been saying or meaning there'.
>
> You start off with one set of categories that one person might come with, we reiterate[1] them [and] you get a different set, that to me is a constructing process, you haven't yet discovered what might be the truth or whatever is behind them in terms of accuracy . . . but there's got to be an element of

[1] A term much used in phenomenography referring to a process of repeated critical scrutiny of categories against the data in order to refine description.

> construction because you're going through that process of getting it . . . there seems to be some joint process going on which might eventually lead to something like discovery but doesn't always get that far . . .

The outcome of the research is a set of categories; these contain a variety of conceptions and thus indicate that there are differences in the ways a phenomenon is understood; furthermore, comparison within the categories illuminates the nature of those differences.

The researcher's understanding of the phenomenon under study clearly influences the construction of categories. Content experts would tend to accept the logical content of the analysis and its categories because it derives, in part, from a content expert who, it is believed, is most familiar with the topic. Educational experts who are more familiar with the practicalities of teaching students and with the nature of non-experts' conceptions, may doubt the researcher's logical set of categories.

In sum, beginning from the point of view which favours construction has some dangers: these include adding or adjusting categories where this is not supported by the data; imposing a logical framework on the data where this is not justified; and analysing the data from the researcher's or content expert's framework, so that the interpretation of the data is skewed towards an accepted or expert view of the phenomenon. That is, the view which promotes the idea that categories are constructed from the data tends to incorporate also the bias of the experts' conception. In this instance, it is unlikely that using a group process to obtain the categories (the content experts iterating between the set of categories and reading them against the data) will reveal the bias of the researchers. To minimise the problem of researcher bias it would be necessary to include in the group researchers with experience of phenomenographic analysis who are alert to such potential problems.

Discovering categories?

Analysis which assumes that categories emerge from—are discovered in the data—rest on the assumption that the categories are constitutive of the data and independent of the researcher's method of analysis. This view 'sees the development of the categories of description as a discovery of what the students are meaning when they talk about particular phenomenon [sic]'. It is assumed that the analysis tries to incorporate all aspects of the data, and that it purports to provide a

holistic account of the phenomenon. In this kind of analysis the conceptions that come to light may cut across what content experts would agree as appropriate ways of viewing the phenomenon:

> My main comment on your paper . . . is to ask you whether you've discovered or constructed a set of categories? When I read through your paper it sounds as if you . . . actually thought you had . . . discovered these categories as if they had some sort of independent existence of the methodology of the person who's looking at the data and the transcript.
>
> No. What I'm saying I suppose is that I'm not consciously changing or disregarding a way of seeing that I think I'm seeing, right? But I'm discovering from the transcripts on the basis that it doesn't fit in with the logical structure that I've currently got from the other conceptions.

The method of giving the categories to other researchers and asking them to classify the set of transcripts against the set of categories, is claimed to establish the reliability of the results and to confirm a process of discovery:

> And so a different researcher might come to the same data [and] could construct another set of categories . . . You don't ask someone else to take your transcripts away and identify the categories and then see how that person's categories matches yours because it's not necessary that person should construct the same sort of categories. What we do is . . . give someone else our descriptions of our categories and ask that [person] . . . to look at the transcripts to see if they [can]. . . categorise them.
>
> You don't have to replicate the discovery process for it to be discovery but rather you need to establish the reliability of the results by indicating that somebody else can categorise the transcripts [not necessarily in the same way as you have].

This view asserts that categories are tools which encapsulate understanding: their purpose is to determine the different ways in which people understand their world (see chapter 1 on the nature of descriptive categories):

> now the empiricist alternative is that the world impinges on you and [also] there is . . . the phenomenological point of

> view that . . .you cannot derive it from the world or from the person but it's a relation between the two. Now it exists between the person and the phenomena and I think the same applies in the research as far as the relation between the researcher and the researched object is concerned. . . .This constructing categories has this flavour to me that you are almost free to come up with something [which] . . . emphasises the categories . . . The object of the research is not the categories but . . . peoples' understanding of the work.

The results are essentially provisional: researchers present what is true in relation to their understanding at that time. The analysis can be seen as a process of 'construction towards discovery', the end point being a discovery of new ways of understanding the phenomenon:

> how far do we go in getting an accurate description of those categories if, for example, we spend two years on the transcripts and it would be better spending three, we stop at two years, publish the results and that might be a construction rather than a discovery? We mightn't have reached the point where everybody would find those same things.
>
> if you've got two sets of categories for the same data it's possible for people rationally to discuss and come to some sort of agreement amongst themselves. . . [that] this set of categories seems to match this data and . . . capture more that's in the data than this [alternative] set of categories. That's not to say that [the first] . . . set of categories . . . has a stronger relationship to some reality than the [second] set. . . . it's to argue that this [particular] set somehow better encapsulates what's in those transcripts better than this [other] set.

A process of discovery means emphasising the similarities and differences in the data, rather than the hierarchy of categories. Focusing on the similarities in the data classified against a particular category develops the detail in that category. Focusing on the differences between sets of data where each set is classified against a different category elaborates the differences between those categories:

> I see it as looking for the differences that are there in the relation between the interviewees and the phenomena, trying to discover what those differences are and where the similarities are . . . the logical relations aspect is something which I see as

> being looked at specifically after you . . . really feel . . . you've discovered the differences between the various ways of seeing.
>
> But I think it [the process] needs to be discovery. I think, for me, the whole purpose is to try to discover . . . the special ways in which people see this phenomenon.

Problems in the idea of discovering categories

The main problem with the idea that reality can be read directly from the data, is that where a given transcript is considered apart from the rest of the interview data this bypasses the wider analytical process. This problem arises particularly when the methodology lacks the strong consistent focus described in chapter 1, and where the research design and the interview concentrate on the 'What is X?' type of question. Maintaining a consistent focus throughout the research plan and an obliqueness in the interview questions, the analysis of the data necessarily draws on the similarities and differences in a group of transcripts; it thereby arrives at a description which encapsulates the meaning of the transcripts overall. As chapter 1 notes, this means considering each transcript in order to maintain the context of the interview.

A logical relationship between categories?

The 'constructivist' view of phenomenography is that categories are constructed through a set of logical relations. The methodology assumes that the data will be refined through iteration to conform to a set of categories which are internally consistent, and intelligible and satisfactory for subject and educational experts who intend to use the results for some further end. Refining implies selecting on data on some basis. If the data is found not to conform to a predetermined logical relationship, then it is discarded:

> Well . . . one or two [interviewees] talked a lot about their teaching in affective terms and we couldn't somehow get that notion into our categories and maintain this relation. Now, maybe with a lot more work we could've evolved a set of related categories in which some of these affective ideas could've [been included] . . . but we couldn't . . . so we've left that out now . . . Now, [we could] . . . have . . . left them in . . . and end[ed] up with not such a. . .nicely related set of categories.

This approach contrasts with that of looking into the data to discover what is there and then attempting to represent all the data very faithfully in the categories by considering the similarities and differences in the data, and then attempting to represent those similarities and differences in the descriptive categories:

> there was an indication of that notion of logical relations playing an explicit part in the development of the categories of description . . . I think what I'm doing is looking at what the similarities and differences are in order to find out what the conceptions are and then say, well how are these conceptions related?
>
> you were focussing then, on having a structured relationship among the conceptions which is competing with your attempt to have the conceptions represent what's in the transcripts?
>
> this is a distinctive guiding principle in the world that you have an assumption that particular [people] are conceiving, conceptualising, the same phenomena [and that] there should be some relation. . . [between their conceptions]. On the other hand . . .we may impose something on this description which shouldn't be imposed.

What is understood by 'logical'? Does it refer broadly to similarities and differences in the transcripts or is it a more precise notion deriving from new understanding?:

> I think that some of the students don't differentiate between velocity and acceleration which is a frightfully common thing while others do . . . So if you have two categories in which one or two aspects are differentiated and another when they are not, that's a logical relation, wouldn't you say?[2]
>
> Well I understand that you talk about a conception being less complete than another because this seems to me to be the

[2] Velocity is defined as instantaneous time rate of change of displacement from an initial position. Acceleration is defined as instantaneous time rate of change of velocity. The evidence from the transcripts shows that students have difficulty differentiating clearly between these two concepts.

The quotation above proposes that a 'logical relation' exists between a conception in which the concepts are distinguished and one in which there is no distinction seen between the concepts. This sense of 'logical' is not the same as the one used in mathematics; it is a much less precise term denoting a loose or very broadly-based relationship.

> nesting idea that . . . you can further develop it a lot in the same line.
>
> Yes . . . I think what you're talking about is the logical relations down at that level [of the relation between group and phenomenon]. I'm saying it's not necessarily going to be apparent at that level [of individual conceptions] which is where we, in fact, look for logical relations. And I think it isn't necessary, it isn't self-evident that if it's there, it will be there.

Logical relations used as a methodology implies selecting the data so that the categories as constructed bear some relation one to another. Arranging the categories in a hierarchy may occur later as a consequence of some framework which has been imposed on the set of categories; or the hierarchy may depend on some internal relation in the data, as the analyst examines similarities and differences in the data and develops their conception of the categories:

> but what we're talking about in hierarchies is not about what's preferable to go for. [I]n fact, [it's] how the conceptions—the categories of description—relate to each other in a logical way and I think there are some where you can't relate them logically, and that's where I differ from some others who think that they must be put into a [logically related] structure . . ..
>
> what we did was we came up with a set of conceptions [categories of description] . . . but we very quickly [came to] . . . see . . . what we thought might be the logical relations, then iterated between those. So very early in the piece we tried to look at the logical relationships and then adjusted our conceptions so.

The question of whether there should be an expectation that categories should relate to one another internally may depend on the purpose of the research.

The uses of phenomenographic research

Research may be guided by pure phenomenographic interest (the range of ways of understanding encompassed in the transcripts) or by some further end such as that of 'developmental phenomenography' (see chapter 1).

Research of the latter kind may require sacrificing aspects of the data to a framework which makes it more accessible, intelligible and

satisfactory to teachers and content experts who may, for example, be concerned with strategies to improve learning. Educationalists and content analysts may have understandings of the phenomenon which they find hard to reconcile with those of others whom they regard as less expert in their area. They might see non-expert conceptions as incomplete subsets of the accepted conception (as they see it) and accept these conceptions as such, but have some difficulty with conceptions they see as tangential to their fully-developed view. However, as Marton and Säljö (1976) note, phenomenography's original purpose was to improve learning; hence researchers expect there to be some 'direction' or improvement in the arranging of categories into a hierarchy. The alternative to this is a sociological perspective where the content of categories can only be noted: in this approach, any sense of improvement would have to be justified explicitly first:

> how do we use these results? How do we use them to improve teaching and help others to improve teaching . . . conceptions of teaching research should tell educational developers something about how to more effectively achieve their own objectives: which [are] . . . to change teachers' understanding[s] of teaching. And the question arises as to whether really this kind of work is doing this or not doing it.

The expertise of researchers?

As mentioned earlier, researcher bias may intrude when the categories are obtained from the data. For example, researchers who are content experts but not experienced in phenomenographic analysis, may acknowledge the expert view of the phenomenon and develop the categories accordingly, despite their seeing the data as pointing to a different view. To some extent this problem can be overcome by the use of a group process where a number of researchers work together, reading the categories against the data, in order to agree on a refined set of categories. Earlier it was suggested that, in these circumstances, a research group should include researchers experienced in phenomenographic analysis who are aware of the problem of researcher bias. This raises two broader questions: what content and analytical expertise should researchers have? And, where a group process is not available, can a lone researcher obtain a set of categories which satisfactorily describes the range of conceptions present in the data?

At the 1991 Symposium many of the researchers had worked in projects where the results were later used in an educational context. These researchers were acquainted with the content area, with phenomenographic method, with the students whom they were interviewing and with the context in which their students were studying. This is not generally the case in research: members of research teams are more likely to vary in such areas: for example, a physics teacher with a good knowledge and understanding of students' likely responses might be a novice in data analysis, and might therefore need to learn the skill of 'bracketing' their perceptions of the phenomenon when reading the data. In effect, the skills of the team are more likely to be a blend of expertise from many sources.

Another critical aspect of the research process which emerged at the Symposium was the importance, in the analytical stage, of continuous questioning among the researchers as they decided where to place a particular transcript in relation to the developing set of categories. It is at this time that the bias of individual researchers can become apparent, to themselves as well as to the rest of the team. There is the opportunity to counteract this bias by a careful reading of the whole transcript, where individual researchers make a conscious attempt to 'bracket' their own perceptions and concentrate on the data in the transcripts. An example of this process in the Physics Project occurs in chapter 4.

So, what detailed expertise should researchers bring to a phenomenographic study? All the skills associated with good study design are required: these include appropriate selection of questions and interviewees, the technical knowledge to inform the questions and analysis, knowledge of the phenomenographic method—particularly the skill of 'bracketing' one's own perceptions in undertaking the analysis—and, if the researchers intend using the results elsewhere, background knowledge of the external context in order to maintain the focus of the study. Often it will be a group of researchers which encompasses these skills and carries out the study.

Could a valid study be conducted by an individual researcher? Some researchers may have the necessary range of skills and expertise. But the lone researcher may find it difficult to bracket his or her own perceptions when reading the data and developing a description of the categories. However, where a lone researcher makes explicit his or her input into the analysis and allows other researchers to check, test and probe the initial results, such bias can be overcome.

Training research assistants

But suppose the task of obtaining and analysing the data is to be given to a research assistant? As phenomenography is still a comparatively new and developing field, it would be very unusual to find a person already trained in the skills of phenomenographic interviewing and analysis. In conventional projects, research assistants commonly work under the direction of a researcher and collect data and analyse it by well-established methods. So, it is likely that the researcher need to give some thought to training the research assistant in technical aspects of phenomenographic research.

What should this training consist of? The project will require a particular technical background.

Take, for example, the Physics Project described in chapter 1, where students were interviewed about how they solve particular physics problems. For this project, researchers needed a background in the teaching of physics, that is, they needed more than a familiarity with scientific technical terms. It is unlikely that a research assistant who had qualifications in physics but no experience in teaching it could have obtained satisfactory interview data. Such a person would have needed further technical training: talking with students, understanding the educational framework within which they are taught, as well as an awareness of the situation in which their instruction and their studying normally occurs.

Then, what training should be given for phenomenographic interviewing?

In the Physics Project it was essential that the interviewer be particularly attentive to what the students were saying but did not respond to the answers as a teacher would. The purpose of the interviewing was not to point out errors in the student's reasoning nor to try to get a student to understand the physics; nor was it important for the purposes of the Project that the students should solve the problem successfully: rather the purpose was to provide an opportunity for the students to reveal their understanding of the phenomenon being investigated. The Project design gave guidance on questions to follow up the initial question. But the interviewer had to be sensitive to knowing when a particular line of thought should be pursued, when clarification should be asked for, when some further explanation of an expression should be pressed for, and when enough had been said about the topic for the purposes of the Project. Training for phenomenographic interviewing should clarify how to approach the interviewee, what kinds of questions are allowed, and

the manner in which these should be asked. Most project designs rely on pilot questions and pilot interviews being able to assess the viability of the techniques.

What kind of training should be given for the analysis of data? How can the researcher ensure that the research assistant was able to get underneath what the interviewees were saying, and the ways in which they were understanding the phenomenon rather than simply recording the different ways they talked about it?

The best training for this aspect of the task is probably to work not in isolation but to join a group where other experienced researchers are engaged in analysing data and developing descriptive categories. As indicated earlier, the most important skill is that of being able to bracket one's own perceptions and being able to read the data for the ways in which the interviewees are understanding the phenomenon: this skill has to be learned through practice. Working with experienced researchers, checking, testing and probing the proposed set of categories in light of the data is probably the most effective way of coming to understand the analytical process.

At what stage should research assistants join other members of the research team?

Chapter 1 emphasised the importance of maintaining a consistent and coherent focus to guide the actions of the researchers throughout the collection and analysis of the data. So, if the research assistants are required to contribute as fully as possible to the project it is probably desirable that they are brought into the team at an early stage when the direction of the project is being shaped. This was the experience recounted at the Symposium:

> In terms of the research assistants . . . they've fairly quickly become members of the team. In fact, to the stage where they've in each case co-authored the papers so in that sense they've been a full member of the team.

But now what if the task of obtaining and analysing data is to be given to a postgraduate student as part of the requirements for submitting work for a degree? All the matters previously considered would apply, but there are further considerations.

If the analysis is to be solely that of the postgraduate student under expert guidance, how valid is the individual process as opposed to the group process? Does the nature of phenomenographic research preclude less experienced individuals working alone, at least while they are still learning the techniques?

If the best way of learning and practising the techniques of phenomenographic analysis is to work with a team of experienced researchers, and perhaps with other students, how is the student's contribution to be assessed? Is it possible to determine the input of the student or indeed any individual in arriving at the final set of categories? How should that contribution be measured against that of the experienced researchers?

Summary

This chapter has sought to raise and explore issues discussed at the 1991 Symposium arising out of experiences of doing phenomenographic analysis. It has aimed to show the diversity of opinion among researchers rather than provide particular conclusions. The following chapters should be read with this in mind, that phenomenographers vary in their methods but share a philosophy.

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CHAPTER 3

Using phenomenographic research methodology in the context of research in teaching and learning

Michael Prosser

Introduction

Phenomenographic research can mean a number of different things. Its early focus was on the experiences of students engaged in studying real academic tasks (Marton and Säljö 1976; Svensson 1976). It described 'how' they went about studying and 'what' they learnt from their studies. The *how* was described in terms of approaches to study, and as having both structural (atomistic and holistic) and referential (surface and deep) components. The *what* was understood as students' conceptions of the subject matter, again as having structural and referential aspects. Both the how and the what were conceived of as relational phenomena, and were identified from rigorous qualitative analyses of transcripts of in-depth interviews with students engaged in particular learning tasks. The transcripts were treated as a whole, and a set of logically and empirically related categories of description were constructed to describe the qualitatively different ways in which the students spoke about how they approached their study and what they learnt from it. The transcripts were then analysed in terms of these categories.

More recently, phenomenography has been concerned only with learning outcomes, or people's conceptions of particular phenomena (Marton 1988). The term 'phenomenography' is no longer used to describe research which focuses on constructing categories of description of people's approaches to tasks and their perceptions of the contexts in which those tasks are conducted. A substantial amount of work is being, and will continue to be, conducted using a phenomenographic research methodology, in which the focus is on describing

the qualitatively different ways people approach and perceive particular tasks in relation to particular contexts. My own work uses what I perceive as 'phenomenographic research methodology' to study teachers' and learners' perceptions of their context, their approaches to teaching and learning, their conceptions of teaching and learning, and the outcomes of teaching and learning activities. The overall aim is to develop an understanding of the relations between the teacher's and the student's experiences of teaching and learning, with the eventual aim of improving the quality of student learning.

Others have argued that phenomenographic research is more akin to an act of discovery rather than of verification (Säljö 1988). This rules out the possibility of prescribing a set of techniques for the conduct of a phenomenographic study. This creates difficulties for those wishing to embark on such studies, as well as for those interested in analysing the validity and reliability of such methods. Rather than attempting to prescribe techniques, one way of dealing with these issues is to reflect on the experience of conducting such research.

Replicating phenomenographic research

This section outlines some of my experiences in replicating and extending previous research on students' understanding of motion, and the relationship between their developing conceptions of motion and their approach to the study of motion in a first-year university physics course focusing on their understanding of motion in their study of Newtonian mechanics.

The study was part of a larger project which looked at the relationship between students' approaches to study and the development of their experiential and propositional knowledge (Prosser 1990). Concept maps and a study process inventory were used to examine the relationship between the approach and the development of propositional knowledge (Hegarty-Hazel and Prosser 1991a, 1991b); phenomenographic interviews were used to examine the relationship between the approach and developments in experiential knowledge (Prosser and Millar 1989). Because students' experiential knowledge is conceived of as their understanding of concepts based upon their prior experiences, it was thought that a phenomenographic approach would be most appropriate. As well, the early studies in phenomenography had been instrumental in focusing attention on students' approaches to study (including their intentions and strategies), unlike previous work which was only concerned with strategies. Finally, the Göteborg group had recently completed a phenomenographic study

of motion in a similar course in a Swedish University (Johansson, Marton and Svensson 1985).

I met Ference Marton on his first visit to Australia and discussed my work with him. He then sent me detailed descriptions of the tasks used in the Göteborg study of students' conceptions of motion. At the time, I felt that I had a reasonable knowledge of the sorts of questions that might identify students' approaches to specific learning tasks. Consequently, our first job was to trial the conceptions of motion's tasks and to develop a set of interview questions to identify students' approaches to study in a whole course rather than on a specific learning task.

In trialling and constructing the interview schedules, I had in mind two aspects of phenomenography's relational focus. The first was constructing the tasks in a way that would encourage students to reflect on their conceptions of motion in the real world, that is, their understanding in relation to real world phenomena. The second was to ensure that, in describing their approaches, they did so in relation to what they actually did while studying mechanics, and why they did those things. The trials were used as a training program for the research assistant with my guidance. Following the success of the trial we proceeded to the main study interviews.

Students in the main study were interviewed before and after studying mechanics. In the first round, students were interviewed about their conceptions of motion, and in the second round they were interviewed about their conceptions of motion and their approaches to study. We asked students to describe what would happen in the motion's tasks and why (for example: A golfer hits a golf ball and it lands on a completely level green—what sort of path will it follow and why?), and what they did in their studies and why (for example: What sort of things did you do in lectures and why?). In the interviews it was relatively easy to get the students to describe the what, but much more difficult to get them to discuss the why. However, the trials had suggested that the why was probably more important than the what. We spent a substantial amount of time considering follow-up probes to particular responses the students were making to the tasks. The quality of the follow-up probes was crucial to the interview data we obtained. For example, when students talk about their study they may say, initially, that the reason they do a particular thing is to help them 'understand'. But careful probing often reveals that by understand they mean being able to recall. In these cases, students' intentions are surface, even though it may have initially seemed to be deep. We found a similar situation for the questions on motion.

The interviews were taped and transcribed. The transcripts then became the focus of the analysis. In analysing the transcripts we were obviously aware of the sorts of categories of description constructed by earlier workers (since we were replicating work by the Göteborg group). During the analysis we attempted to keep our minds open to the possibility of constituting new categories of description or of further clarifying existing categories. As the analyses of such transcripts, from a phenomenographic perspective, is more akin to an act of discovery (or constitution) rather than an act of verification, the processes of analyses are difficult to describe (Säljö 1988). In analysing the four tasks of motion and approaches to study, we developed categories of description for each task and for the approach independently, then iterated, or sorted through the categories, searching for inconsistencies and adjusting the categories in the light of these inconsistencies. We justified this process on the grounds that the sets of categories were internally related, and not, theoretically, independent of one another. Thus, in practice, our sets of categories were not independent of one another. We believe that the iterations and adjustments resulted in substantially better sets of categories than if they had been analysed completely independently.

More specifically, both the research assistant and I had complete sets of transcripts, and the research assistant's first task was to constitute a set of categories of description for the first task. Previously she had read a reasonable amount of the phenomenographic literature, and we had discussed both the literature and the trial interviews in detail. She was asked to read through the whole set of transcripts for the first task several times until she felt she was reasonably familiar with them. She was then to try to constitute a set of categories which she felt encompassed her perceptions of what the students were trying to say. She then went back over the transcripts, adjusted the categories, and cycled between the categories and the transcripts until she felt she had a reasonably stable set of categories. When she had completed this task, we met to discuss the set. Her first set of categories had little logical relationship to them. My task at this stage was to read through the transcripts, decide whether I felt the categories reasonably represented the conceptions reflected in the transcripts, and adjust the categories in a way to construct a more logically related set. This was done by analysing the categories in terms of their structural and referential aspects. After some discussion we agreed on a set of more logically related categories. The research assistant took this set, again cycled between the categories and the transcripts, adjusted the categories and produced a third set. We then cycled through the whole

process until we felt we had developed a reasonably stable set of categories. This process was conducted for each of the four tasks and for the approaches to study.

The next stage was to return to the individual transcripts and analyse them in terms of the categories we constituted. We did this independently for the first motion's task and the approaches to study. We discussed our categorisations, and came to an agreement on them. The research assistant then categorised transcripts for the remaining three motion's tasks, which I verified. Having completed this we examined the categorisations, and where there seemed to be mismatches, we returned to the transcripts, and either adjusted our categories, adjusted our categorisations or retained the mismatch, depending on our interpretation of the transcripts. We repeated this several times over a number of meetings. Finally, we agreed on sets of categories of description for each task and approach which were logically related in terms of their structural and referential aspects, and on categorisations of each task and approach in each transcript. Neither the sets of categories of description nor the categorisation of the transcripts could be said to be independent of each other. This is a logical consequence of theoretically considering that the sets are internally related, and of the consequent various iterations described above in constructing the sets of categories and categorising the transcripts. We were, however, very confident that the process resulted in a much improved description of these students' experiences than if we had treated each task and approach independently.

The whole process was time-consuming and intellectually difficult and challenging. It required us both to maintain an open mind to our work, and to be willing to adjust our thinking in the light of our discussions. Constituting the categories so that they were logically related, and true to the data, was a difficult task. In the process we came to understand in some detail how the other thought, which seemed to be an important aspect of the eventual success of the project. It should be remembered that this project was in many ways a replication of previous work, and the thought of setting out into previously uncharted waters was somewhat daunting. The two projects to be described in the next section, from this perspective, were just that.

New phenomenographic research

In two research projects, one looks at students' approaches to, and outcomes of, studying in a first-year university 'electricity' course, and the other at first-year university physical science teachers' conceptions

of teaching and learning and approaches to teaching. The former study was conducted by a research assistant and me, and the latter in collaboration with another researcher, Keith Trigwell, and a research assistant. Both focused on issues associated with data collection and analysis, and the role of research assistants.

Conceptions of electricity

The 'electricity' project was designed as a follow-up to the previous project. Electricity is taught in the same course as mechanics, the subject of the previous project. The follow-up study was conducted two years after the earlier study. It aimed to constitute a set of categories of description of students' conceptions of some fundamental concepts of electricity, and to relate students' conceptual development to their approaches to study. In the earlier study, we had found it very useful to iterate between the approach and conception in reconstituting the mechanics categories. Thus, in the electricity study, we included the approaches to study partly to help us constitute the categories and partly to further study the relationship between approach and learning outcome.

In the electricity study, we were not replicating previous research, hence the development of the tasks was a major first step. After several discussions with those teaching the topic, we decided that the fundamental concepts to study were: the magnetic field, the electric field, electric current, and electromagnetic induction. We then devised four tasks, one for each of these concepts. In designing the tasks, we wanted to ensure that they were based upon students' prior experiences of the phenomena under study. The tasks were as follows:

1. I've put two magnets here on the table like that with their poles as shown in the diagram.

   (students were shown a diagram)

   What do you think will happen when I take my hand away and why?

2. I rub the pen in my hair and you can see what is happening—why do you think that is happening?

3. I've got a very simple circuit like this, a battery, a resistance and a switch.

   (students were shown a diagram)

If I close the switch like this, what do you expect will happen and why?

4. I have a solenoid connected to a meter. When I move the magnet into the loop, what do you think will happen and why?

(students were shown a diagram)

These tasks were trialled on four students, the research assistant and I each doing two. The tasks seemed to work satisfactorily, with the second task being less satisfactory than the other three. We decided to stay with the second task, but spent some time discussing appropriate probes. In the event, even with the revised probes, that task worked little better than the original task and probes. The results of the task were not analysed.

The approaches to study questions were similar to those used in the previous study, but with the addition of a question asking students what they thought learning meant in that course.

In analysing the 'electricity' sections of these transcripts, neither I nor the research assistant could anticipate what might be found. I first asked the research assistant to analyse the students' approaches to study in terms of the predetermined surface and deep categories; I gave her the results of the previous study of approaches to study of mechanics and asked her to replicate that analysis in this study. I independently analysed the approaches. We met and discussed our categorisations, and after further analyses and discussion, came to an agreement on the classifications. As in the previous study, it was initially difficult for the research assistant to distinguish between a deep approach, and what has been termed elsewhere, an achieving approach (Biggs 1987). Once she saw this distinction, the categorisation was relatively straightforward. In retrospect, this was a useful training procedure. It forced the research assistant to consider students' intentions and to come to terms with a focus on what was signified in the transcripts, rather than just the signs.

In the next stage, the first 'electricity' task was analysed. I asked the research assistant to read through the transcripts several times until she felt she had a reasonable knowledge of their contents. She was then to think about the half a dozen or so ways in which the students conceived of the phenomenon being investigated. She was also to consider how her categories might be related hierarchically. Some time later she reported her categories and how they might relate, but was left with several transcripts which did not seem to fit her cat-

egories. My task was to read through the transcripts with her categories in mind, but with a particular focus on those transcripts which were problematic to her. I then reconstituted the categories, keeping in mind the aim of developing a better structured set of categories, and a set which would better encompass all the data. After another discussion at which the categories were further refined, she took the new set of categories and cycled through the data again. That is, she attempted to categorise the transcripts in terms of the new set. She identified further problems, the categories were further refined during a discussion, and a new categorisation undertaken. This process was repeated several times. On each cycle we analysed our categorisations in relation to the categorisation of the approaches. Some of the approach categorisations were refined, but, more importantly, the process helped us restructure our categories of descriptions.

We repeated the whole process for the next task, but now instead of having only the approach categorisations to compare our new set of categorisations to, we had the approaches and one set of conceptions. We constructed the set of categories of description for the second task. In the process we refined our categorisation of approaches, and refined our categories of descriptions of the first task and our categorisations based upon those categories. The same process was undertaken for each task in turn, with refinements being made to our categorisation of approaches and our categories of descriptions for the previously analysed tasks.

Thus, the sets of categories of descriptions and the categorisations of approaches and conceptions were not independent of each other, but were worked out in relation to each other. In the construction of the sets of categories, we focused on the part of the transcript for that task, and rarely referred to other parts of the transcripts. In this regard, the parts of the transcripts were kept separate. Thus the sets of categories of description were worked out in relation to each other, but not in relation to the same data.

Approaches to teaching and conceptions of teaching and learning

Elsewhere, my colleague, Keith Trigwell, has focused on this project in some depth. Here I make only a few comments. The project aimed to identify first-year university physical science teachers' approaches to teaching and conceptions of teaching and learning. We adopted a phenomenographic approach to the study, and conceived of the approaches and conceptions as relational. We did not conceive them to be static entities in a cognitive structure, but dynamic relations between

teachers and their teaching contexts. Thus in developing the interview schedule we were careful to get the interviewee to select a first-year course that he/she had recently taught, and describe it in some detail. We then structured the interview into three parts, the first focusing (but not necessarily exclusively) on the interviewee's approaches to teaching, the second on their conceptions of teaching, and finally on their conceptions of learning. Each of us conducted some trial interviews, which were transcribed and reviewed in terms of the quality of the interviews. Our focus at this stage was on developing probes to be used in different situations. Having decided on an interview schedule, we conducted the interviews which were transcribed and analysed.

The analysis, as in the previous cases, was the most difficult and time-consuming aspect of the study. We began by each of us constituting a set of categories of description for the approaches to teaching. This we did by focusing (although not exclusively) on that part of the interview centred on approaches to teaching. We met, and after comparing our sets of categories and further discussion and debate, constituted an agreed set of categories. Each of us took the set, analysed the categories in terms of their intentions and strategies, read through the interviews again, met, compared our categories, reconstituted them, returned to the interviews, and repeated the process until we had a reasonably stable set of categories. During this process we cycled between the construction of a logically related set of categories (mainly at our meetings) and the transcripts (mainly on our own). The meetings tended to focus on reconstituting the categories, and on our private work on checking to see that the categories were represented in the transcripts.

Having constituted categories of description for the approaches to teaching, we turned to the constitution of categories for the conceptions of teaching. The major focus, though not exclusively, was on those parts of the interviews dealing with conceptions of teaching. A similar process was repeated, although we also included the categories of description of approaches in our iterations. Thus, the approach categories were also reconstituted as we constituted the conceptions of teaching categories. After several meetings and reconstitutions we arrived at a reasonably stable set of categories and turned to the constitution of categories for the conceptions of learning. Again a similar process was pursued, but this time the categories for the approaches to teaching and conceptions of teaching were included in our iterations. So, finally, we arrived at three sets of related categories of descriptions, with which we all agreed.

Our last task was to return to the transcripts and do a final categorisation of the transcripts in terms of the constituted categories.

This included two independent categorisations for each of the approaches and conceptions, comparisons of these categorisations, and some minor adjustment to them.

Discussion and conclusion

From this somewhat limited range of experiences, what do I see as some of the important issues to emerge for consideration in the conduct of phenomenographic research?

Aims of phenomenographic research

My background in student research in the physical sciences, with its emphasis on identifying 'students' misconceptions' and developing instructional strategies aimed at changing conceptions, has resulted in my interest in trying to see learning (and more latterly teaching) from an experiential perspective. That is, I believe we need to look at teaching and learning from the perspective of how those engaged in teaching and learning see it. The recent research into teaching and learning, showing that students' learning outcomes are closely related to their approach to learning, and that that approach is closely related to their perceptions of the learning context, reinforces the importance of the learners' perspectives. Much of the previous research in science education, which has focused on conceptual change, has attempted to develop instructional strategies using comparative-experimental methodologies. This research has, in the main, been unsuccessful. I suspect the main reason is because it takes no account of students' conceptions of learning, or of their intentions in the learning process (Prosser 1990). Phenomenographic research is one approach to research which deals substantively with these issues.

A second issue that arises from the experience of conceptual change research in science education is that that research is aimed at developing prescriptive solutions to the problems of teaching and learning, whereas the phenomenographic research is much more descriptive. The phenomenographic research looks at how teachers and learners in naturalistic teaching and learning contexts approach their teaching and learning, and how these approaches relate to the students' learning outcomes in those contexts. My belief is that problems of teaching and learning are not likely to be solved by attempting to prescribe how teachers and learners should approach their teaching and learning, but by developing techniques and ideas which will help teachers and learners critically reflect upon their present

teaching and learning practices. The development of prescriptive solutions is unlikely to be successful, unless they can somehow take account of the individual perceptions of those involved in the teaching and learning process.

Finally, much of the research in student learning, even if it does focus on the learners' perspectives, conceives of conceptions and approaches as static and cognitive, residing within individuals. It takes little account of the contextual dependence of conceptions and approaches. The phenomenographic research, on the other hand, conceives of conceptions and approaches as dynamic and as relations between individuals and the context. Changes in context can result in students and teachers adopting different conceptions and approaches. A major issue for research on teaching and learning is: How do contexts, and perceptions of contexts, in which students and teachers adopt more appropriate conceptions of, and approaches to learning and teaching, differ from those in which they do not?

Methods of conducting phenomenographic research

Here I comment on the use of research teams in interviewing and constituting categories of description, and on the database used for the constitution of the categories.

In each of the projects outlined above, two or more people have been involved in interviewing and category constitution, including a research assistant who was a novice in using phenomenographic research methods. My experience suggests that the use of research assistants in interviewing is somewhat less problematic than in category constitution. Even so, careful training and monitoring of interviewing techniques is essential. While it is relatively easy to get interviewees to describe their strategies, it is much more difficult to get them to discuss their intentions underlying their strategies and their conceptions of phenomena. Careful and systematic probing is required which maintains a focus on the particular context in which the approach and conceptions of phenomena are being studied. This requires an experienced and alert interviewer, who is willing to systematically monitor and review his/her own approach to interviewing. In the studies in which I have been involved, I have found it essential that the novice interviewer be involved in all aspects of the development and trialling of the interview protocols. This allows the novice to develop an understanding of the intentions underlying the interviewing procedures. In trialling the interviews, it has been beneficial to have both the research assistant and the project leader(s) conducting and analysing trial inter-

views. An initial analysis of the trial interviews allows the novice interviewer to develop a deeper understanding of the intentions underlying the interviews. In many respects, the intentions are just as important as, or even more important than the strategies.

Having conducted the interviews and obtained the transcripts, the single most important phase is the analysis of the transcripts and the constitution of the categories of description. Novice analysers have difficulties in (a) bracketing their prior knowledge, and (b) producing a coherent set of categories rather than a 'shopping basket' of categories based upon a content analysis. I have found that an appropriate way to begin is to ask the novice to focus on the half a dozen or so ways in which the interviewees have responded to the questions. The novice is advised not to be concerned about categorising individual transcripts, but to treat the set of transcripts as a whole. This is a difficult task, involving a substantial change of focus, and not easily adopted. In order to help focus on the categories and not on the categorisation of individual transcripts, I have found it useful to take the initial set developed by the novice and, in discussion with the novice, to focus on reconstituting the set into a more logically related set of categories, with little reference to the transcripts. Having reconstituted the set, the novice takes it back to the transcripts, and reconstitutes it again in relation to the transcripts. By this stage, the novice has usually focused on the set of transcripts as a whole and on the categories of description. The reconstitution of the set, somewhat independently of the transcripts, is a powerful means of getting the novice to focus on the categories rather than individuals. A final set of logically related categories of description usually emerges after a dozen or so iterations between the reconstitution of categories in relation to the transcripts and in relation to its logical structure.

Finally, some comments need to be made about the database on which the categories are constituted. While Svensson (1976) has argued that the categories should be constituted using the same database, but with different foci of analysis, this has not been the way in which I have approached the analyses. My approach has tended to be to divide the transcript into its related parts, and to constitute the categories for each part, in relation to the categories constituted for the other parts. This is not to say that other parts of the transcript have not been used, but that the focus tends to be on a particular part. While it may well be better practice to maintain a focus on the transcript as a whole, I have found this to be a reasonably difficult task.

This description and analysis of the way I have approached several research tasks using a phenomenographic research methodology

is a personal account of my own approach, which may, or may not be valid and useful for others. I would not therefore wish to assert that others should necessarily adopt these approaches. But I would hope that the questions and issues raised in describing and analysing my approaches may be of value to others embarking on, or involved in, a very exciting and continually developing field of research.

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CHAPTER 4

Experience of phenomenographic research: A personal account

John A Bowden

Why have I undertaken phenomenographic research? What do I do in that research? How does such research relate to my role in educational development? These are three questions I address in this chapter.

Background

For the last twenty-five years I have taught at tertiary level in one capacity or another.[1] From 1967 to 1973, I was a laboratory class demonstrator, tutoring and lecturing in undergraduate chemistry; since 1974 I have been teaching in various diploma and degree courses in education as well as having substantial involvement in providing academic development programmes for university staff. In addition, and not insignificantly, I have had two sons reach Year 12 at school: the dual role of parent and educationist I've found brings significant pressure to bear on an academic's educational theories. I have been engaged directly in phenomenographic research only for about six years.

On reflection, I see a thread of consistency through all of these experiences as well as growth: a certain commitment to the idea that learning concerns changes in the student and, consequently, teaching should not be viewed simply as an activity by the teacher per se but rather as an activity focused on enabling learners to make changes in their own thinking. A multitude of teachers hold this view and it's a subject of research in itself (Dall'Alba 1990, Martin & Balla 1990). But as I expanded the range of my teaching eventually to include 'teaching about teaching', I increasingly felt the need to be able to explain the steps I took in my teaching in a more comprehensive and coherent way.

[1] All the references to time in this chapter derive from 1993 when the chapter was written.

What is common to helping students in a laboratory, lecturing undergraduate chemistry students, running seminars on philosophy of science teaching for experienced secondary school teachers, discussing teaching and assessment methods with university lecturers and advising university management about academic policy and its relation to quality of student learning? For me, all these activities involve me in creating a context in which the other person can develop a different view of the world, or at least that part of the world under consideration. This is clear to me now but it wasn't earlier, despite my having some successes in practical terms. The work of Ference Marton, his colleagues and those who have followed him, has enabled me to make sense of my practice. It has provided a theoretical base that explains my past teaching practice; the theoretical base helps me improve my practice and provides me with a way of seeing my current role in educational development, from the individual through to the institutional level.

In the early 1980s, I became aware of the research on learning by Marton and others in Sweden, and by Entwistle and Ramsden, among others, in the United Kingdom. I found a perspective on learning that made immense practical sense; it provided an insight into why some developments I had made in my own work had been successful and others not. It encouraged me to think further about the relation between processes of academic staff development and undergraduate teaching. In 1986, I saw that:

> in a sense, phenomenographic research mirrors what good teachers do. It tries to understand what the students are doing in their learning. It attempts to discover what different approaches students are taking and to understand these in terms of the outcomes of their learning activities. Good teachers do that as a preliminary to further action to help their students come to understand the concept concerned and, of course, many do it instinctively. That is the appeal of Marton's work, of most phenomenographic research into learning; teachers can identify with both the methodology and the findings (Bowden 1986, p. 10).

Just as the research and its theoretical base have developed over the last decade so, too, has my own thinking about learning, teaching and staff development. I have coined the term phenomenographic pedagogy:

> because of the confusion arising when phenomenography is compared with theories of instructional or curriculum design. The terms 'phenomenography' and 'phenomenographic research' have often been used interchangeably and it is clear that distinctions need to be made between various activities derived from the view of learning underlying phenomenography. Phenomenographic research, a particular approach to the conduct of research into learning, is not in itself a theory of learning or a theory of instructional design; it is, of course, based on the learning theory characteristic of phenomenography. The same way of thinking about learning has been applied to curriculum development and teacher education processes (Bowden, 1988; Ramsden and Marton, 1988). It is the theory underlying these applications to teaching practice, which I have labelled phenomenographic pedagogy, that should be compared with other theories of instructional or curriculum design (Bowden 1989).

My approach to phenomenographic research

This paper is intended to convey an understanding of how I go about a phenomenographic research study, why I work in that way and what the implications are for the ways in which such research can be used to influence educational practice. The research experience I am drawing on is the physics project I began several years ago with Paul Ramsden, Geofferey Masters and myself as principal investigators and involving a large number of researchers from Australia, England and Sweden. The work I shall refer to in detail is that part of the project I have carried out more recently in collaboration with Gloria Dall'Alba and Eleanor Walsh.

What is phenomenographic research from my perspective? First, my focus is on teaching and learning issues. Within that focus on educational issues, I see phenomenographic research as providing a method of discovering what meanings underlie the way individual students see particular phenomena. In a recent manuscript submitted for publication, we described our research approach as follows:

> This study uses the phenomenographic research approach developed by Marton (1986, p. 31) to discover the 'qualitatively different ways in which people experience, conceptualise, perceive, and understand various aspects of, and

phenomena in, the world around them'. The concern is not only with the phenomena being investigated, nor just with the people who are experiencing the phenomena but rather with the relation between the two, with the ways in which people experience or think about the phenomena. Specifically, the present study is concerned with the ways in which physics students experience or understand selected concepts and principles of kinematics.

Phenomenographic descriptions are based on ways of understanding particular phenomena and therefore are qualitative. This does not imply that quantitative content cannot be explored phenomenographically. Indeed, one set of data described in this paper is concerned with a quantitative problem and the descriptions we report deal with the qualitatively different ways in which this quantitative content is understood.

In phenomenographic studies it has been found repeatedly (Marton, 1986, p. 30) that 'each phenomenon, concept or principle can be understood in a limited number of qualitatively different ways'. The present study assumes that a limited number of conceptions of the concepts and principles under study can be found. The conceptions are presented in categories of description that constitute the main outcome of the research. These categories are drawn from interview data; there is no attempt to 'fit' the data into pre-determined categories. The categories are based on the most distinctive features that differentiate one conception from another and are presented in the form of a hierarchy, reflecting increasing levels of understanding. The hierarchy of the categories of description displays the relation between the conceptions and provides a basis for decisions about teaching and assessment. This focus on making explicit the relations between the conceptions is one of the characteristics of phenomenography that distinguishes it from other approaches, such as alternative conceptions research.

It is important to note that the stance we take is that learning occurs when students move from one level of understanding to another more complete one. Furthermore, the origin of any person's current understanding is likely to include both formal instruction and everyday experience. It is inappropriate to try to separate the aspects of students' understanding that derive from the two forms of experience. As soon as a teacher utters one sentence in a physics lesson or a parent offers a stu-

> dent a logical explanation of an observed phenomenon, the student's way of seeing the subject under discussion is likely to draw on both formal and informal experience. The task for teachers is to discover students' conceptions of the phenomenon under study and to devise ways of helping their students change their understandings. It is unhelpful to consider the teacher's task as one of encouraging students to dismiss their 'common sense beliefs' and embrace scientific beliefs. In this regard, we share some of the views of Halloun & Hestenes (1985) who argue that 'common sense beliefs . . . should be regarded as serious alternative hypotheses'. We would go further and argue that it is impossible to label a particular way of seeing as exclusively a 'common sense belief'; all ways of seeing are an integral mix of interpretations of both formal and informal experience. Trowbridge and McDermott (1980) exhibit similar thinking when they argue that 'students . . . are likely to have a wide variety of . . . ideas . . . based on intuition, experience, and their perception of previous instruction'. However, thinking about why certain beliefs may be held can lead teachers to devise interventions aimed at encouraging students to develop their understandings. The focus in this paper is on the discovery and description of students' understandings as data on which teachers can base their decisions about intervention to assist student learning (Bowden, Dall'Alba et al.).

Physics project methodology

The manuscript also went on to provide further details about the study:

> Thirty first year students in two universities and sixty final year (Year 12) high school students were interviewed about their understanding of particular concepts and principles of kinematics being investigated. These students of physics responded to a total of 14 questions. Questions were assigned randomly among the 90 students prior to interview, with each student answering four or five questions in an interview of approximately one hour. Hence, 25 to 30 responses to each question were obtained. The interviewers attempted at all times to encourage the students to give full explanations of their understanding by non-directive questions such as 'Could

you explain that further?', 'What do you mean by that?', 'Is there anything else you would like to say about this problem?'.

All interviews were transcribed and the transcripts subjected to rigorous phenomenographic analysis. This involved one member of the research team taking the responsibility for reading all transcripts related to a given question and devising a draft set of categories description that were drawn from the transcripts. That researcher then re-read the transcripts and made tentative allocations of each transcript to one of the draft categories. The other researchers carried out the latter task independently. The allocations of transcripts to categories were compared. Where there were disagreements about category descriptions or allocation of transcripts, they were resolved with reference to the transcripts as the only evidence of students' understandings. The focus was on the student's meaning, taking the transcript as a whole, rather than on the occurrence of particular statements corresponding to a specific category description. An iterative process was used to produce final descriptions of categories that reflected the similarity in understanding among the transcripts allocated to each category and the differences between the categories.

An example from the physics project

The best way to explain my approach to phenomenographic research is to take a specific case. The methodology description above is taken from our most recent paper and therefore describes our most recently completed analysis. The research procedures are consistent throughout our other analyses in the physics project and I decided that for this Symposium, a more informative example would be the one we are currently working on. It is not possible to give a slick description of the outcome because we haven't reached that stage yet. What I will do is describe the struggle that inevitably takes place before you can be sure of the outcome.

One of the tasks asked of the students in the physics study is as follows:

> A parachutist jumps from a plane at a high altitude and falls for 10 seconds before opening the parachute. Describe the motion of the parachutist before and after the opening of the parachute.

The terminal velocity in air for the parachutist with a closed parachute is 50 m/s (= 180 km/h); with an open parachute it is 5 m/s.

The acceleration due to gravity is 10 m/s^2 (= 36 $^{km/h}/_{s}$).

Clearly the issue students were asked to discuss is about terminal velocity. The transcripts were obtained as part of the broad data collection described above. It was my responsibility on this question to do the initial analysis, to formulate some draft categories and to suggest which transcripts belong in each category of description. Version 1 of the draft was produced in November, 1990. At the time of first writing this account we were working on version 12 (produced in May, 1991). Version 1 had five categories of description, version 12 has seven but that may be reduced to six.

The focus in the analysis has been on students' understanding of terminal velocity. This matter of focus is important. In my view, you must have a focus as you read the transcript. In all of the analyses we have done, I have read all the transcripts many times—at least six and sometimes a dozen times. On each occasion, I seek some new perspective in order to clarify what the student means. On each occasion, the reading of the transcript is a new experience. To read the transcripts in order to query the similarities and differences represented in, say, version 3 of the categories of description, is a different experience from reading them all again in order to illuminate version 10. The multiple readings are necessary in order to explore all the possible perspectives and because, whenever an aspect is being queried, I believe it must always be explored with reference to the whole transcript rather than to one small section of it. I look for the key elements of the phenomenon as seen by the interviewees, and the way they see those elements relating to each other and to their underlying meaning of terminal velocity.

My way of seeing the phenomenon

In this particular case, student understandings of terminal velocity are related to the way they describe the motion of the parachutist before and after the opening of the parachute. How do I see the phenomenon? For the purposes of this discussion, I will ignore the complication caused by considering the initial (horizontal) velocity of the plane and the parachutist and consider the vertical motion alone. The description then is the same as if the parachutist had jumped from a hovering helicopter, for instance.

I assume that on leaving the plane, the parachutist's vertical velocity is zero. There are two forces acting on the parachutist—the force of gravity and the force of air resistance. The air resistance is proportional to the square of the velocity. Thus initially the force of the air resistance is very small while the force of gravity is constant. Initially, therefore, there is a net force (and acceleration) downwards which means that the parachutist's velocity is increasing at a relatively rapid rate. As that velocity increases, so too does the force of air resistance increase and the net force (and acceleration) decreases. Thus the rate of increase in velocity is reduced. Eventually, the velocity reaches a value at which the force of air resistance has become equal to the (constant) force of gravity. At this stage, the net force on (and acceleration of) the parachutist is zero. Since there is no net force, the parachutist continues at that velocity until some other force is introduced. That constant velocity is called the terminal velocity. There is insufficient information to judge whether that terminal velocity is reached within ten seconds. If it were reached, the parachutist would continue at the terminal velocity until the parachute is opened.

Upon the opening of the parachute, there is an increase in the force of air resistance. Not only is air resistance related to velocity, it is also related to the surface area of the body in contact with the air. Due to the large surface area of the parachute, the force of air resistance becomes much greater than before and therefore much greater than the force of gravity. There is a net force and acceleration vertically upwards. This means that the velocity downwards is decreasing at a certain rate. As the velocity decreases, so too does the force of air resistance and so the rate of decrease in velocity diminishes. Eventually, at a particular velocity when the force of air resistance has reduced until it is again equal to the force of gravity, the net force on the parachutist is zero, there is no acceleration and the parachutist continues to move at that velocity until some other force comes into play. That constant velocity is the terminal velocity under these conditions.

It should be noted that there are differences in the two segments of motion. The terminal velocity with the parachute closed is reached from a lower velocity. The velocity increases from zero until the terminal velocity under those conditions is reached. The terminal velocity with the parachute open is reached from a higher velocity. The velocity reduces from its value before the parachute is opened until the terminal velocity under those conditions is reached. There are some other relevant issues such as the asymptotic approach to terminal velocity which I won't discuss in detail here.

The analysis of the transcripts

In version 1 there were five categories. The first category of description A approximated to the above. The second category B had the same basic structure but it seemed that the relation between the force of air resistance and the force of gravity was unclear. At the time, a large number of transcripts were considered to be in one of these two categories but it was not possible to assign them all because the differences between the two categories were not yet fully articulated. Category of description A has survived through to version 12 although with modification; the category B in version 1 now appears to be a composite of three subcategories (B1, B2 & B3) in version 12 although we feel that further analysis may cause us to combine two of these subcategories. Four of the eighteen transcripts originally assigned to categories A or B in version 1 are no longer assigned to any of the categories A, B1, B2 or B3 in version 12.

The remaining three categories of description in each version correspond to each other although the detailed descriptions have undergone significant modification with further analysis. One (category C) is concerned with the idea that terminal velocity is reached because the velocity and acceleration of the parachutist both increase until their maximum values are reached; the acceleration cannot exceed g, the acceleration due to gravity. In another (category E), the motion is considered in two segments with the velocity beginning at zero in each segment and increasing to the different terminal velocities. The other category of description (D) is minimalist and it is not clear that an understanding of terminal velocity as a constant velocity exists.

The above gives an overview of the categories as they were initially and are now. Let me give a further insight by describing in more detail our current task of trying to decide if the original category B is a composite of two or three subcategories.

A number of the transcripts in B (version 1) and B1 and B2 (version 12) treat the first segment of motion in a characteristic way. It is argued that terminal velocity is reached after about five seconds because, since the acceleration due to gravity is 10 m/s^2, the velocity increases 10 m/s each second and reaches 50 m/s in five seconds. In the same transcripts, the notion of terminal velocity is discussed in terms of the equivalence of the forces of air resistance and gravity. However, despite this, the relation between air resistance and gravity is not taken account of in determining when terminal velocity is reached. The two explanations sit in apparent conflict and are not resolved. At first, we wondered whether this was a general characteristic of category B. Now

we believe B3 may be a third category; no conclusion is drawn as to whether or not terminal velocity is reached in the first ten seconds. However, the reasons for this appear to involve confused understandings of the relation between air resistance and velocity rather than the type of explanation given in category A description. We are as yet unsure whether B3 should be combined with B2 since the remaining aspects of the phenomenon are described in similar ways. We will have to read B2 and B3 transcripts again with this in mind. Is there a distinction between them? Is it of a kind that demonstrates an underlying difference in meaning of terminal velocity?

The difference between B1 and B2 relates to the understanding in B2 of the way the relation between air resistance and velocity in the second segment of motion leads to terminal velocity.

What we have now, therefore, is a rough approximation—seven but perhaps only six categories, draft descriptions that need to be refined, allocation of transcripts to categories of description and further modification of the descriptions to accommodate any shifts of transcripts from one category to another. The whole process is an iterative one.

What goes on when I am reading a transcript, comparing transcripts and discussing the analysis with my co-researchers?

All the time I am reading a transcript, I have in the back of my mind the question 'What does this tell me about the way the student understands terminal velocity?'. In other words, what must terminal velocity mean to the student if he or she is saying this or that? There is a tendency to want merely to describe the things the student says and then to group them according to the things that are said in common. In effect, the categories of descriptions do reflect some similarities and differences of this kind. However, my experience now tells me that they are consequences not determinants of the categorisation. Students often say similar things to each other but their underlying meaning is different (for example, one may use the word acceleration to mean change in velocity and another may use it to refer to rate of change of velocity in a particular direction). Students also express similar ideas in quite different terms. These similarities and differences can only be discovered by holding all the ideas in mind at one time and trying to draw a picture that explains the underlying meaning of virtually the whole transcript. If the student understands terminal velocity in this way, then it may be no surprise that he or she has described an aspect of the motion in a particular way. But why has the

student discussed another aspect of the motion in another way if the way of seeing terminal velocity is as we thought? And so on.

Again, when comparing transcripts I ask myself whether these two or more students see terminal velocity in a similar way. Are any differences between them significant in the sense that they relate to a fundamentally different understanding of terminal velocity? Why do I think they are similar? Why do I think they are different? To get the answer I must always go back to the whole transcript.

This is where the group discussion among researchers becomes of paramount importance. Our procedure has been for the person primarily responsible for the particular analysis to explain their reasons for the categorisation and description, and for the other members of the group to test and probe. This constant 'devil's advocacy', which works both ways when the proponent queries the basis of the objection, provides the discipline that ensures the full evidence of the transcripts is extracted and used to determine the final categories of description. The emphasis on justification based only on the evidence of the transcripts maximises the likelihood—if not ensuring —that the categories of description accurately represent the range of student conceptions within the particular sample interviewed. Individual researchers are often blinkered by their own way of seeing and I would fear doing phenomenographic analysis alone. I believe that I could convince myself that I had questioned every assumption I had made, but I am sure that discussion with others who had also read the transcripts would force me to do more and to uncover lapses in my own analysis of which I was unaware. I would welcome discussion by those who carry out phenomenographic research alone. How do you ensure that you have taken the data as far as possible?

An example of the effects of the group process

I will describe one aspect of the analysis which demonstrates how the group process works and how the iterative process characteristic of phenomenographic analysis leads to new insights.

In the initial reading of the transcripts, I was aware that there were five in which the student had discussed the second segment of motion (with the parachute open) as an approach to terminal velocity from a lower velocity. This approach from below, parallel to the approach to terminal velocity with the parachute closed, led me to hypothesise that in these transcripts, terminal velocity is seen as a maximum velocity that must always be approached from below. It seemed to me that if this is an accurate representation of the way of

seeing terminal velocity, then it is quite different from the view that is shown in categories A and B described above and warrants being described as a separate category (category E in early versions).

Through successive versions of the categories of description, as other categories were being refined, the existence of a coherent category of the kind described in the previous paragraph was debated by the three researchers. For a long time, I supported its existence in the face of substantial argument. Eventually the arguments began to convince me that my view was unsustainable. Further readings led us to place three of the transcripts into category B and to rewrite category E around the remaining two transcripts.

What brought about the change in view? The major reason for my reluctance to change was that in reading the transcripts, my focus for a long time was on the fact that all five in question either asserted or considered the possibility that the velocity of the parachutist went below the terminal velocity some time after the parachute was opened. I was seeing that as the most significant and fundamental characteristic of these transcripts, and it coloured my reading of them. Hence I was unable to see similarities these transcripts had to other categories of description. And, because of this fundamental similarity, I was also unable to see the variations in these transcripts.

Eventually, when I began to focus on the basic principles — searching for the features that characterise a group of transcripts within a category of description and those that distinguish one category from another—I saw the situation differently. Three of the five have much more in common with the descriptions in category B than with the other two of the five transcripts in question; and in each of the three, the conviction that the velocity in the second segment falls below the terminal velocity at some stage is not strong. The other two transcripts, when considered alone, stand out primarily because the students consider that when the parachute is opened, the velocity becomes zero and it is from this basis that the argument is made that the velocity then increases until terminal velocity is reached. Category E is now more coherent and complete.

Perhaps, in the absence of the transcripts, it is difficult for the reader to follow the change in view I have described, other than to observe that it happened. The role of the group discussion process was important in reaching the conclusions we have so far. The description given above exemplifies the way we work in the research group. It is a constant debate with analytic accuracy its objective. It does result in any given individual being confronted with challenging perspectives from other group members. These challenges result in either modifi-

cation to, or consolidation of existing category descriptions. I find it hard to imagine such a process were I carrying out the same analysis on my own. I don't believe I would achieve the same outcome and I believe the categories of description developed alone would be less accurate than those developed by the group. For this reason, I argue for the group process to be a normal feature of phenomenographic analysis.

Why undertake phenomenographic research?

It is difficult to give a direct answer to the question—Why undertake phenomenographic research? It is easier to describe the benefits of having become involved in such research. Since I use the theoretical base and the research outcomes in my pedagogical activities, it is helpful to be familiar with the way such outcomes are achieved. It is one thing to make the distinction between phenomenographic research and phenomenographic pedagogy in a theoretical sense. It is another to experience the difference. And for me the experience of carrying out phenomenographic research was remarkably revealing. When I began, I soon realised that I had no idea how to go about a phenomenographic analysis of interview transcripts, despite the advice and guidance I had received. It was only by experiencing the difficulties and participating in discussion with others working on the same transcripts that I developed my understanding of, and skills in using the methodology.

However, learning to undertake the research is a useful outcome in itself. I feel able to carry out further phenomenographic studies and to interpret published studies in a way previously limited. In addition, the research experience has contributed to my way of seeing pedagogical and other practical issues differently. My pedagogical direction hasn't changed but a number of my ideas or beliefs about teaching and learning have been sharpened by the experience. Some are self-evident but they are reinforced by the research experience. They include the idea that:

1. students' ways of understanding particular aspects of the world may differ even when they give identical answers to, say, quantitative questions about its characteristics;
2. teachers need to listen closely to what a student is saying across a number of aspects of the problem at hand if they are to comprehend the understanding that the student has of a particular phenomenon or concept;

3. it is important for teachers to avoid leading questions or statements, or even directive nonverbal cues, when they are trying to 'listen' to students;
4. having students question their own understandings has a powerful potential for learning;
5. many students are unfamiliar with a style of questioning that focuses on their understanding rather than on producing a 'correct' answer;
6. it is important to note the influence of the context in which a question is set on the understanding the student has of the phenomenon involved;
7. students may be extremely competent and confident in using algorithms to produce solutions while being unsure about qualitative explanations of the same phenomena.

All of these matters are important in the research sense but they are also important pedagogically. If phenomenographic research does mirror what good teachers do then there ought to be lessons in these observations from the research process itself. And there are. Good teachers do try to listen in order to discover students' understandings; they avoid leading too much in order to minimise regurgitation of their own ideas and to enable them to apprehend the students' real understandings; they try to encourage their students to reflect on their ideas, in varying contexts, in order that the students will discover new insights and develop their understanding; they construct assessment exercises that go beyond calculation of the numerical answer. The research experience underlines the importance of these good teaching practices and provides teachers with concrete evidence that this is so.

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CHAPTER 5

A phenomenographic interview on phenomenography

Keith Trigwell

Interview introduction

Before I start this interview I'd like to give you some overview of what I am trying to achieve. I am doing a phenomenographic study of phenomenography. My aim is to describe the qualitative variation in the way a group of people experience the phenomenographic approach to research. I intend to interview about fifteen people. In this interview with you I would like to explore your ideas of phenomenography—the ways you think about it and the way you use it. I have prepared several key questions to ask you in three areas—phenomenography itself, your phenomenographic methods, and applications of phenomenography. Depending on your responses, these questions may be followed up by other questions. At this stage I do not have predetermined categories into which I hope to be able to slot your responses. The aim of these interviews is to collect the data from which the different categories should emerge, so some of my follow-up questions might be wide-ranging. However, I do have a knowledge of the phenomenographic approach and I am aware that my experience will influence both this interview and the analysis. As we agreed when I first contacted you, I will be recording the interview on audiotape as it will be transcribed along with others in the study. Is that still OK with you?

Yes.

OK, let's go.

Phenomenography

What would you say phenomenography was about?

[pause] The easy ones first eh! . . . um [pause] . . . er.

OK, let me put it another way. What does phenomenography mean to you?

A research method, a way of describing phenomena. No, maybe that's more what others think—just another name for much research which is currently being conducted, including their own qualitative work, or as a narrow and elitist offshoot from qualitative research with an evangelistic following . . . um. But that's not really what you're asking is it? Essentially I think of phenomenography as a qualitative approach to understanding the world.

I'll come back to that, but I'd like to pursue your definition a bit further. You said phenomenography is not about describing phenomena. What then would you say it is?

Well, in a way phenomenography is concerned with describing a phenomenon. But the description is based on the different ways people experience or think about that phenomenon. Describing a phenomenon is a first-order method of research. For example, a description of approaches to teaching based on observing several teachers is a first-order method. A description of teaching using the perspective of the teachers is a second-order method. Phenomenography is one way of studying teaching from the perspective or experience of the teacher. It describes the qualitatively different ways in which people experience and understand various aspects of the phenomenon. That doesn't mean it just describes the structures that are in people's heads either. Phenomenographers have the view that meaning is constituted in the relation between the person and the phenomenon. The meaning of all phenomena is the total of all human experience of that phenomena. It is expected that there will be qualitative variation in that experience. This is the relational or constitutionalist view which underpins phenomenography.

You have introduced loads of ideas I want to explore further. First, what do you mean by qualitative variation?

The best way I know to illustrate this is an example of qualitatively different conceptions of learning shown in transcripts of interviews Roger Säljö conducted.

Could you write them down?

Sure. I might not remember the precise wording, but I can give you the general meaning. In that study, five qualitatively different conceptions of learning were described:

Learning was seen as:

A getting more knowledge or increasing knowledge;
B memorising;
C using a store of facts, algorithms, formulas, etc.;
D looking for meaning;
E an attempt to understand reality.

As you can see, these are different kinds of conceptions. It is not possible to imagine an individual changing from say conception A to conception B by doing more or less of what is contained in conception A. The conceptions have a different idea of, and focus on, the phenomenon which, in this case, is learning.

A person who thinks of learning as a search for meaning has a more complete conception of learning. It may include memorising as a component in that learning, but it is not restricted to that—it goes well beyond it. The two levels are qualitatively different. It is important to know that different people work with different levels of conception. For example it is difficult to encourage students to adopt a deep approach to their learning if those students see learning as no more than memorising.

You also mentioned conceptualisation as being relational in nature before. Can you say what you mean by relational?

My understanding is that there are several ways in which something is relational. The first I've mentioned: the non-dualist perspective in which meaning derives from the relation between person and phenomenon. In the second, the way a situation is seen or felt or whatever, depends on the context. Johansson and others wrote in 1985, 'This relational quality reflects a view that a person's experience is strongly influenced by their intentions or purposes and the context in which the phenomena are embedded, in turn, influence the experience'. This is an important aspect of phenomenography. It is what gives its outcomes so much power and relevance. On the negative side it limits the generalisability of the outcomes to contexts as found in the study. But that just means we have to do lots of studies.

I'd like now to discuss the things you do in a phenomenographic study, and why you do them.

Phenomenographic method

You said earlier that you also saw phenomenography as a research method. First, why have you adopted this method?

I thought I said phenomenography was a research approach, but I adopted it because it seems to make sense to me. I'm not sure if that's a sound academic reason, but I don't come from a social science research background. I was—and many of my colleagues from the physical sciences still are—very sceptical of the value and validity of much of the education research we were exposed to as neophyte science lecturers. To put it crudely, it seemed to us to be based on the results of laboratory experiments rather than on the experiences of the people involved, and the results stated nothing more than the obvious or were superficially prescriptive. The results which could have been of value seemed to have been based more on what people believed than on empirical data.

Phenomenographic research appeals to me because it is conducted in a real setting. It looks at issues through the eyes of the key players, not an independent and therefore uninvolved observer; and it is somehow able to better represent the complexity of educational settings and situations to produce meaningful and useful conclusions. It is also novel for me to be looking for something that might be there rather than for the extent to which something which is hypothesised to be there. I know I've said things which the purists will reject; there is no such thing as an independent observer, all research is theory-driven, etc. I'm not disputing those positions, I'm simply saying that at the methodological level, the idea of looking in a mass of (loosely constrained) data for some order, and qualitative differences and relations, is more appealing in complex situations where, at times, our knowledge seems limited, than prescribing the parameters into which data will be channeled (which is what happens in much research based on questionnaires).

The method is also consistent with my everyday work. Trying to understand the way academic staff think about teaching or learning, or about how students think about aspects of chemistry is an important part of my job.

Having said all that, it's got its problems as well. It's not easy in the current research climate to adopt a methodology which, by its very nature, is time-consuming, is difficult to conduct with any research assistance other than with very experienced people (who are hard to get), and where it's probably harder to get the findings published

(though that is changing) than in other areas that colleagues in similar situations are adopting. It's the quality and utility of what comes out of it that tips the balance for me.

How do you go about collecting data?

I arrange to interview fifteen to twenty people about the phenomenon. I ask questions about a specific case or situation, because of the relational nature of the conceptions which emerge from this work. In our case, for example, the situation is teaching in a particular subject. The interview usually takes place in their office in the case of staff, and mine in the case of students. On one of our projects, a research assistant went through an interview induction programme and then carried out most of the interviews. We record the interviews, transcribe them word for word and pause for pause, and put the transcripts in a big pile and leave them for a few weeks.

Once again you've raised many things that I would like to pursue. The first I suppose, is to pick up on your relational point. That means I should ask you to respond to my questions by referring to a specific research study. Which one will you pick?

The best one would be science teachers' conceptions of teaching and learning and their approaches to teaching at first-year university level.

Right. The second point I wrote down was 'Why do you pick fifteen to twenty interviewees?'

The aim of the exercise is to constitute, from the transcripts, a range of categories of description of the experience of the group of interviewees. There are two limiting factors which favour fifteen to twenty interviewees. At the lower end, I would say ten to fifteen would be the minimum to create a reasonable chance of finding variation in the range. Preselection of interviewees can help in this process. If it is suspected that person X might describe an interesting conception or one which might be considered extreme, that person could be included in the sample. In this way a range can be found with numbers less than fifteen. The limiting factor at the upper end is the volume of data produced. One of the fundamentals of phenomenographic analysis is that (at least initially) the interview transcripts be treated as a whole, without regard to individual variation. More than twenty transcripts from interviews as long as sixty minutes is a lot to wrap a brain around in one go.

Yes, I was going to ask you about how long the interviews are. Is sixty minutes normal?

The ones I've done have been between forty and sixty minutes, but in both cases they were in sections. The full time may be on different sections. The sections would be about twenty minutes each on average. It is possible to do the analysis by section, provided the sections don't overlap too much, but the whole transcripts may still need to be considered. Actually, um, I don't think the way I've done it gets much support from my colleagues in the field. But in terms of time, they would need to continue until the interviewer feels the experience has been described, and the meaning of relevant words has been revealed.

This part of the interview is getting out of hand. I've still got several questions from an earlier statement to come back to, and now you throw out a juicy controversial statement.

Let's stick with that. What did you mean your way doesn't get much support from your colleagues?

[Pause] This is a bit difficult. We interviewed in three sections in our first study—approaches to teaching, conceptions of teaching and conceptions of learning. There is overlap, or internal relations, between these areas. Or, at least, we assumed there might be. One of the things we were intending to explore was the relations between conceptions and approaches. In a batch of responses to, say, the approaches to teaching questions, we identified concise descriptions of conceptions of teaching and learning. The differences are not great and I think they were not discernible by some of the interviewees. For example, if you consider an approach to contain an intention and a strategy, then an intention such as 'I feel I have to get across a lot of information in lectures' is not very different to a transmission conception. It therefore follows that analysis of a section needs to involve the complete transcript, not just that section in which the specific question was addressed.

It was obvious from our transcripts that lecturers said a lot less about their conceptions of teaching and learning—the two sections that came at the end of the interview—than about their approaches. I think part of the reason for this was that they felt they had answered the conceptions questions in response to *why* they had adopted a particular approach. Several actually said they thought they'd already answered the questions on conceptions of learning and teaching.

So how did you actually use the sections?

As I said, if I was working on conceptions of learning, I would start with that section, but also look at the whole transcript at some stage, then go back to work again on that section.

OK. Let's go back a bit. You said you put the research assistant through an interview induction programme. Why?

My idea of interviewing in this research methodology is to be exploring at greater and greater depths of thinking without leading. Or at least, not leading with new words or phrases. All, or nearly all, my questions after the initial trigger question or event, have as their subject meaning something the interviewee has already said. Of course, the something picked up is leading to some extent, but only down the paths of further clarification of issues I am interested in. I believe it can be a confusing process for an interviewee, especially a suspicious one. I've had a case where it was necessary to continually probe with why questions and then the general question asking is there anything else they'd like to say about what they do or think. Out of frustration that person pointed at the tape recorder and said, 'I thought I'd said enough in all that. What is it you *want* me to say?'.

So what do you do with the research assistant?

Oh yes [pause]. Actually there are different schools of thought on the use of research assistants, too. I guess I have my doubts about their use, even though I think in our first study we had an excellent RA. For the interview to be a success, the interviewer needs to be very familiar with the phenomenon being asked about and the interview method. In the area of university science teaching at least, it would be difficult to find research assistants with both qualitative research skills and knowledge of science.

How did you overcome the problem?

In my present study I am conducting my own interviews. In the case where we used a research assistant, there were three of us in the research group. Well before we intended to interview, the RA read widely in the area to be researched—conceptions of teaching and learning—and the research method—phenomenography. Nearer the interview time, we first tried interviewing each other and then discussed the recorded interview, making comments to each other on how we could improve. One of the chief researchers then conducted

an interview with a member of the sample group, and this recording was critically analysed by all three by focusing on what the interviewer said, rather than the interviewee. The sorts of things we picked up on were whether the use of certain words such as 'understand' should have been pursued further to ascertain the contextual meaning, or different and clearer ways of asking key or trigger questions. Each of the three researchers then conducted two trial interviews each, and again these were analysed. Despite all this, we all thought that as more interviews were conducted, the quality improved. Of course, the interview topic was new to all of us; I mean we hadn't interviewed in the area before. It's possibly a shortcoming with our study and maybe others as well, that the limited number of interviews means that we are just getting good at it when we stop. Maybe we should have circulating specialist interviewers. X does physics, Y does teaching.

OK, and another intriguing comment from earlier. Why do you leave the transcripts in a pile for a few weeks?

As I said earlier, the aim is to consider the transcripts as a set, not individually. Letting them sit together in a heap helps the process of assimilation or fusion or coalescing or something. I guess it's some sort of osmotic process. [pause] No. [pause] Sorry. [laughs] The reason is that I find the analysis very demanding, and I tend to put it off as long as I can. It probably isn't a good idea, but the only time I can do the analysis effectively is when I have absolutely no interruptions. That happens rarely in my day-to-day job.

What do you find demanding about the analysis?

Having to keep a lot of ideas active at the same time. You've got say twenty transcripts with a lot of detail in them. You start to get a feel for what might be being said from one transcript, but then the next one you look at destroys any order you just managed to establish. So you try to hold two, then three, and so on. Getting started is very hard. I was forever conscious in my attempts at the analysis not to jump to conclusions about what the transcripts were saying. Even now I'm not really sure that what we've described is the best description that could have come out of the transcripts, but it is the best we could do. What we did do was a time-consuming process.

Why do you need to study the transcripts as a whole?

[pause] Once again this is difficult to explain, but it relates to the fact that in phenomenographic analysis, the parts and the whole define each other dialectically. Categories of description are constructed by grouping parts of the transcripts together according to their similarities and differences. There are times in the analysis when the focus is, and has to be, on the parts. But in order to see whether these parts are, in fact, parts of the same category, the focus also has to be on all the transcripts. Similarly, the categories of description of the conceptions are all internally related. Each is also a part of a whole set of conceptions. It is not possible to see a category unless it is seen in the context of the whole.

I'm not sure I understand you.

I'm not sure I understand myself.

Do you want to have another go?

No.

I feel I should be pursuing this, but, [um] OK. This might be a good time then, to look at the analysis and how you went about it. You said there were three of you involved in one study. What were your roles?

On the first topic we started by looking at five transcripts on just one of . . .

[interrupts] Is that each of you doing the same five or five different ones each?

We all looked at the same five. Our aim was that each person would individually generate a first cut of a range of categories of description from the transcripts, and we would discuss the three sets. The first set we came up with were different to each other and different to what we finally ended up with.

Have you got copies?

Yes, or at least the headings of each category.

> Researcher A: teaching as:
>
> a) facilitating learning
> b) communication—two-way enquiry (challenge/question)

c) communication—one-way (develop love, interest)
d) transmission
e) being an ambassador

Researcher B: teaching as:

a) facilitating students' own learning
b) relating concepts to students' own interests
c) showing practical application of ideas
d) getting across ideas (knowing they are received)
e) being an example to imitate
f) being committed to syllabus
g) helping students remember
h) helping students pass exams
i) getting across ideas (transmission)

Researcher C: teaching as:

a) encouraging learning by getting students to ask themselves questions. Focus on students and student understanding;
b) enthusing students and communicating with students. Focus on students and their attitudes;
c) enthusing and showing great ideas. Focus on ideas;
d) leading students through the discipline. Focus on the syllabus;
e) explaining concepts so students can pass exams. Focus on syllabus and exams.

These are from the same transcripts?

Yes. Having got these lists we went through many iterative steps mainly involving explanations of why we came to the categories that we did. We continually referred back to the sorts of things people said in the transcripts to explain our conclusions. As this process continued it became clear when we were using a different title or phrase for the same thoughts, and in those cases the descriptions were renamed and combined. For example, the three (a) conceptions described above all came from the one transcript, and we quickly settled on a common description. In other cases, one person had picked up something the others hadn't and after discussion, if we agreed, we tried to incorporate the extra description in the agreed set. After each of these sessions at least one of us went back to the transcripts to check to see if our new formulations were still consistent with the interview data.

Initially, the idea that the categories we came up with should be related, was a real difficulty. It seemed to make the task doubly hard, not only did categories need to be differentiated qualitatively, they had to have connections as well.

This is the way most of the analysis evolved. There was one instance though which significantly changed the direction of that evolution. As I've said, we were looking at the three different components of the study separately at different meetings (but still using the complete transcripts in each discussion—or at least two of us were, I'm not sure we ever came to any agreement on that one). As we were developing one component, we came up with a structure which we thought would help with the other two areas. It did, and we ended up looking again at the other two components from the perspective of our development in the first. This process was a major leap forward compared with the iterative processes that took place either side of it.

What do you look for in reading the transcripts?

In a transcript I was looking for some overview of a conception. It might have come from a series of complementary statements in the transcript or from one major definitive statement. I'm pretty sure that I brought some possible conceptions with me to the analysis. These came from discussions we had before we started, my knowledge of the people we interviewed, my knowledge as a chemistry teacher, my knowledge from student days, and the comments I heard in the interviews I conducted. With these thoughts not deliberately present, I tended to read the whole transcript making notes (one line comments or short quotations) on the important things each person was saying. I collected about a half page of these for each person. I would then use that as a set and go through them in an attempt to make sense of the range of comments. Between the transcripts I was looking for variation. Sometimes I would reorder the sheets to put those who seemed to be saying similar things together, and attempt to order the set hierarchically.

Sometimes in some transcripts it was really obvious what the person was saying. A way of describing the phenomenon was reiterated again and again, and what was being said was clearly different to a large proportion of the other transcripts. This was particularly true at the extremes of the range as is shown by the extremes in the conceptions we each came to independently. It was possible to pick this up even during the interview in some cases. As soon as they started talking it was clear that they were saying something different. In those cases I think I may have used those descriptions as a point from which

to build others. For example, once I'd found what looked like an obvious conception—say teaching is about the transmission of knowledge—I would apply that to my reading of the other transcripts, asking 'What are they saying that is similar to or different from transmission?'. This may have explained why the three of us differed so much (or appeared to) in our first runs through.

Did you discuss among yourselves the detailed way you approached the task, or why you may have got this variation?

No, I guess we thought it was 'healthy' to have three different sets from the data. I think I've thought more about the detail of the process during this interview than we had through discussions in the group. But that's not to devalue the group process. I think working with at least one other is essential and, in part, it addresses some of concerns about reliability and validity.

OK, what happened then?

When?

After you found what you thought were different conceptions.

Then I would go back to the transcripts and read them all together—in one go I mean—keeping in mind the categories I had constituted earlier, and seeing if they described the whole batch. This usually resulted in some fiddling with the descriptions, but did not really change anything of mine in any significant way. The big changes in my conceptions came when we all discussed our categories.

You said earlier that you'd made a major leap forward at one stage. Is that the same big change?

No, that was a significant change to all our thinking. We had got quite a long way down the track with our analysis of conceptions of teaching. We were describing our categories of description using two components: how the explanation is given and what is focused on. The explanations seemed to have been given in terms of how the teacher helped students learn or in terms of how the teacher teaches. What was focused on was what the teacher teaches, not the content as such, but whether the content was as the teacher would see it or as the student might see it.

We were really struggling with conceptions of learning at this point, especially where applications fitted in. The application of this same structure—the how and the what—to conceptions of learning helped enormously, and gave us a way forward. Mind you, it didn't relieve the problem of applications, but it did give us a mechanism to allow us to refine our outcome. We even went back to approaches to teaching and were able to see there, that the intentions behind the approach were also qualitatively differentiated using the teacher-helping-students-learn and teacher-teaching categories.

What do you mean by the how and the what?

Two internally related aspects of a category. If you like, an action (how) and the something being acted upon (what). For example, transmission is the how and the content is the what. We actually saw the how and the what as the same as the structural and referential.

What do you mean?

Yes, I haven't explained that very well. The structural and referential are also two internally related components of an experience. Not all individual descriptions will contain both, but within a group it is usually possible to see both components. I guess we saw them as being the same. Our 'How is the explanation given?' was also our structural component. Our 'What is focused on?' was our referential component.

What was interesting was something I talked about just a while ago. Our structural component, which may have been called a how component in other studies, related very strongly to the approaches to teaching categories. In this sense it was a How (does the teacher teach) component, or at least the intention component of that approach. The separation of the approaches from the conceptions was useful for us, but it is a bit like in this interview, separating what I say I do from what I say I think.

I want to return to that topic, but first I want to bring you back to what you are not happy about with respect to hows and whats and introduce a why?

I can see why they are there, but the part I'm not happy about is that others seem to use them in different ways at different times. For example take two papers, Johansson, Marton and Svensson—no three actually, that one, Marton in Schmeck and Marton, Dall'Alba and Beaty. Admittedly they are separated by some time, and this may represent

the evolution of the thinking about this method, but they seem different to me.

I think of the components more as a heuristic than as an underpinning tenet of the phenomenographic method. Structural and referential I think I can explain best by reference to an example. It is how others separate those terms from what is called the how and the what that I'm a bit [um] fuzzy about.

What is the example?

The one that comes to mind first, because I've just been reading about it, is by Jackson and it relates to essay writing. The referential part is what is being referred to: the content. In an essay in which students are asked to compare Locke and Rousseau on the social contract, the content selected by two students could be essentially the same, as shown in this figure. However, the structural components are quite different. A third student might use either structure, but have a different content or relational component.

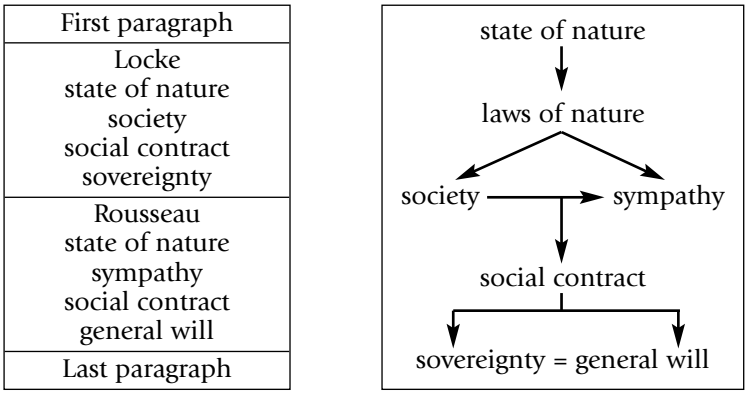

Figure 2: Variation in structure of an essay on the social contract

How does this relate to transcript analysis? What did you mean earlier by a heuristic? Sorry, what I'm really asking is why use them?

The use of components helps describe not only the qualitative differences between conceptions, but also the relations between conceptions: an important component in the results of a phenomenographic study.

The use of the two components in our study also helped break down the process of building up the conceptions while maintaining the relations between them. It made the task easier by, for a moment,

reducing the focus to a manageable level. So, in the conceptions of teaching we were using the structure of the set of categories as being either student-centred or teacher-centred; and then for each of these the focus could either be the teaching of the teacher's concepts of the subject, the syllabus or textbook concepts, or the students' conceptions. The same explanation in terms of student- or teacher-centred activities appeared in the other two parts of the study.

How did the study of teacher's conceptions of teaching end up?

We constituted six qualitatively different categories of description from the group. This is not unusual: the number is usually small—two to nine or thereabouts.

> **Conception A** Teaching as transmitting concepts of the syllabus
>
> Teachers holding this conception focus on the concepts detailed in the syllabus or textbook, but see their role as transmitting information based upon those concepts to their students. The focus is not on how the components of the information are related to each other, or on students' prior knowledge.
>
> **Conception B** Teaching as transmitting the teachers' knowledge
>
> With this conception of teaching, teachers again focus on their own conceptions, but see their role as transmitting information based upon those conceptions to their students. Again the focus is not on how the components of information are related or on students' prior knowledge.
>
> **Conception C** Teaching as helping students acquire concepts of the syllabus
>
> With this conception of teaching, teachers focus on the concepts as detailed in the textbook or the syllabus, and see themselves as helping their students acquire those concepts and relations between them. Unlike conceptions A and B, students' prior knowledge is seen as being important.
>
> **Conception D** Teaching as helping students acquire the teacher's knowledge
>
> Teachers holding this conception, rather than focusing on their students' conceptions of the subject matter, focus on

their own conceptions. They see their role as helping their students acquire subject matter concepts and relations based upon the teacher's conceptions.

Conception E Teaching as helping students develop conceptions

Teachers holding this conception of teaching focus on their students' world views or conceptions of the subject matter rather than their own conceptions or the text's concepts. They see their role as helping them develop their conceptions in terms of further elaboration and extension.

Conception F Teaching as helping students change conceptions

Teachers holding this conception of teaching again focus on their students' world views or conceptions of the subject matter rather than their own conceptions or the text's concepts. They see teaching as helping students change their conceptions or world views.

The referential and structural components are present in each of these descriptions, but you can see from this table how they help define and relate the categories. In several cases, two categories have a common structural or referential component, but they differ qualitatively in the other.

Table 1 Categories of description of first-year science teaching

Structural	**Referential**		
	Syllabus/text Concepts	Teachers' Conceptions	Students' Conceptions
Teacher transmitting Information	A	B	
Teacher helping students Acquire Concepts	C	D	
Develop Conceptions			E
Change Conceptions			F

Why is the number of categories of conception usually small?

I guess because for a relatively homogeneous group there are a limited number of qualitatively different ways of thinking about something. I've often wondered whether the selection of a wider range of experience in the people we interview would result in a larger number of conceptions. As far as I know, all the studies done on specific academic topics such as physics have only been done on physics students. What would happen if you added a few arts students and a few politicians and a few backyard inventors? Would the range increase? We didn't find a very different range of conceptions of teaching with our select science group than Dall'Alba found with a mixed group. But in both cases they were all teachers. Marton, Dall'Alba and Beaty did find one extra category of description of learning in their study of Open University students than Säljö found in the original study on Swedish students. It's hard to imagine what other categories there might be sometimes, but I suppose we won't know until we try interviewing others.

Is there anything else that you do?

I haven't really mentioned anything much about the quotes from the transcripts which support or illustrate the descriptions of each category. This was not a formal part of the development of our categories. By that I mean that we used the quotations which each of us had brought with us to explain our own descriptions, but it was after the formulation of the description that we went back to the transcripts to find the best quotations that illustrated the category.

But how did you formulate your descriptions?

Well we couldn't just use the comments verbatim as a category of description. There was a process, part of the iterative one I spoke about earlier, where we gradually defined the categories by including or rejecting the spirit of the quotes.

The other thing I suppose, was the matching of the transcripts to the categories. After we had settled on what we thought were good categories of descriptions, two researchers independently classified each of the transcripts in one of the categories. When we were in doubt, that is, the classification seemed to lie between two, or fit OK with two, we would still try to pick one while indicating both. The two independent classifications were then compared and the differences discussed.

There were some problems of the context within the context here. We had deliberately picked a narrow context (first-year science

teaching) but found that the different parts of that teaching (lecturing, tutoring, labs) were subcontexts and the descriptions from one person reflected qualitative differences in the different subcontexts.

Finally, let's look at how you use phenomenographic results.

Application

What is the value of this method?

That seemed to be quite a leading question. I suppose I've got to answer that it's the way the results can be used. Understanding the different ways people experience a fundamental, or indeed any phenomenon is of value. The idea that a university teacher could experience teaching as the transmission of knowledge is very important to, say, an academic developer. It helps explain why contact between teaching staff who hold this conception in that particular area of teaching and the developer is minimal. When contact does come, it comes in the form of a rejection of the developer's task as being trivial and non-academic, or in the form of requests about whether students can hear at the back of the lecture room. That is, ways of improving transmission.

The second point is the outcome of this method of analysis. The set of related categories of description of the phenomenon being studied, known as the 'outcome space', shows how the categories are internally related. The image which in part attracted me to this approach, because it showed me its value, was produced by Lybeck and others on the mole concept in chemistry. They showed, graphically, the nesting of the different ways of understanding the mole, from limiting to more and more sophisticated. The fact that some students don't have the important knowledge or perspective that is a part of the sophisticated conceptions helped explain to me why some students have trouble with this aspect of chemistry.

How are the results misused?

I suspect a common misuse derives from other research which might appear to be similar. For example the work of Piaget or Perry. Perry's forms of intellectual and ethical development among college students are descriptions of stages through which students move as they progress through college years. That is, people develop from lower levels through to higher levels. They might not necessarily go through all

stages to get there, but they do go through stages. This is not necessarily the case with hierarchical categories of description arising out of phenomenographic studies. The categories are constituted from self-reports of a group of people, a bit like a snapshot of that group at a particular time. The range of categories arises not through individual development, but because the categories are relational or peculiar to the individual in a particular context. So a group of individuals would normally exhibit a range of categories in a particular context. The same group might exhibit a different range in a different context.

Similarly. it would be a misuse to consider that, in order to foster a more complete conception, one needs to address each of the intermediate conceptions of the group between that held by an individual and that desired. Having said that, it would not be a misuse of the results to use the relations between conceptions to develop a mechanism to facilitate conceptual change.

Thank you. You've addressed most of the points I've raised with respect to what you do and think about phenomenography. However you might remember earlier on you talked about the approach component of your study of science teaching. This interview was also about approaches. How much of this interview can legitimately be called a phenomenographic interview? Another way of addressing my question is can you get at conceptions by asking people what they do?

Yes, I think it could be called a phenomenographic interview, but its not exclusively so—it could be called other things too. As far as the second question is concerned, I'm not too sure. The question can be turned around: Could you, from this interview, get a feel for my experience of phenomenography? In the main, I have been talking about what I do in the process of phenomenographic research and then responding to an occasional follow-up 'why' question. If I was blindly following some set of instructions on carrying out research phenomenographically without thinking about what I was doing and without giving any explanation as to why I was doing something, then maybe the approach is not connected to an intention or a conception. But in cases like this where the method has been adopted because it fits, or is consistent with, an intention, I feel that conceptions are revealed.

OK. Well, thank you. As you noted earlier yourself, analysis of this work is time-consuming, but when we get it finished, if you'd like to see what we produce, I'd be happy to send you a copy.

Yes, I would like to have a look.

OK, but I should point out that I am not returning the analysis to you for you to comment on the accuracy of my analysis. Because the outcome space of a phenomenographic study describes the variation within the group, rather than rich descriptions of individuals, it is the aspects of the variation that are the focus. For this reason it is not possible to critique the outcome without access to the full data set.

OK.

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CHAPTER 6

Reflections on some faces of phenomenography

Gloria Dall'Alba

My aim here is to describe some research studies in which I have been involved, emphasising the research methodology and the principles underlying that methodology. I have selected particular examples to demonstrate how studies with varying purposes and methods can be based on principles of phenomenographic research. Phenomenography is a research approach which seeks to explore the qualitatively different ways in which aspects of experience are understood, perceived, or conceptualized (Marton 1981, 1986; Marton, Dall'Alba & Beaty 1993). This approach is based upon the principle of intentionality (Husserl 1970/1901), namely that experiences such as understanding or perceiving are directed towards something understood or perceived. Accordingly, understanding or perceiving cannot be separated from what is understood or perceived.

In phenomenographic studies it has been found repeatedly that 'each phenomenon, concept or principle can be understood in a limited number of qualitatively different ways' (Marton 1986, p. 30). Each of the three studies described in this paper assumed that this would also be the case for the phenomena, concepts and principles under investigation.

Ference Marton (1988) outlined what he referred to as three lines of phenomenographic research, indicating the range of types of such research which had been carried out. The first line of research concerns 'content-related studies of more general aspects of learning' (1988, p. 191) such as the relation between the learning process and learning outcomes. Typically in these studies 'the qualitative differences in the outcome of learning are consistently related to qualitative differences in approaches adopted by the learners' (1988, p. 189). These qualitative differences in learners' approaches have been shown to relate both to how the learner perceives the learning task or context and to their understanding of what learning is (Säljö 1982).

The second line of phenomenographic research involves the study of learning within particular content domains, for example, mapping students' understandings of concepts and principles in physics. Marton (1988, p. 192) points out that these first and second lines of research are based on 'a phenomenographic view of learning . . . as a transition between qualitatively different conceptions of some aspect of reality or of some phenomenon therein'.

The third line of phenomenographic research 'corresponds more to a "pure" phenomenographic "knowledge interest" as it is focused on the description of how people conceive of various aspects of their reality' (p. 190). An example is Theman's (1983) study of conceptions of political power which was conducted during a demonstration against the construction of a garage in the centre of Göteborg in Sweden. The major difference between the second and third lines of research relates to whether or not the phenomenon or aspect of reality being described has been the object of formal studies by those whose understandings are being explored.

I have outlined these three lines of phenomenographic research to point out that research within the phenomenographic tradition takes a range of forms. The studies which I will consider in this paper provide further evidence of this. Phenomenographic research arose from attempts in the early 1970s to provide more illuminating investigations of learning and teaching in educational contexts. Following the initial emergence of this research approach, the three lines of research outlined above could be discerned. More recently, phenomenographic research has tended to be conducted primarily in educational contexts, so that the first two lines of research are more prevalent than the third.

As the research I have been involved in has concerned learning associated with formal settings, the studies I describe fall within the first and second lines of phenomenographic research outlined above. I will describe two studies that differ in focus but which both fall within the first line of phenomenographic research concerned with more general aspects of learning. The first of these studies investigated the relationship between learning strategies, approach to learning and learning outcomes. The second study explored conceptions of learning in academic contexts among university students. I will then describe a study that falls within the second line of phenomenographic research which is concerned with the study of learning within particular content domains: in this case, understanding of physics concepts and principles.

Learning strategies, approach to learning and outcomes

In this study I explored the relationship between the process and outcomes of learning science at the lower secondary school level (Dall'Alba, 1986a, 1986b, 1987, 1988). This study investigated what students did in carrying out typical classroom science tasks and what they learned from those tasks. Unlike the typical classroom context, however, no direct teaching took place. The students carried out each task individually, without reference to a teacher or other students. Ten science students (five female and five male), aged between thirteen and fifteen years, completed four tasks on separate occasions, with an interval of approximately two weeks between tasks. The learning tasks were: reading and comprehending a passage of science text, carrying out an experiment on heat transfer, making notes on a passage of science text, and completing a problem-solving task. Each student's performance was examined from one task context to another in order to determine whether they displayed variation or consistency in their learning across tasks.

The collection and analysis of data for one of the tasks, the heat transfer experiment, will be used to illustrate the study's methodology. The experiment involved exploring the transfer of heat by materials of different types, namely white cloth, aluminium foil, and white cloth behind glass. The students were provided with the necessary apparatus and a set of instructions for carrying out the experiment. They were required to cover three thermometers with the three different materials, heat them under a strong light globe and record the temperatures at fixed time intervals. This task was adapted from Northfield (1976).

The focus of the data collection and analysis was the relationship between the learning process and outcomes. Often in the research literature (for example, Biggs 1979, Goldman 1972), the learning process and outcomes are treated as separate entities, and so it is assumed that independent measures of the two are possible. In contrast, in the present study, the process and outcomes of learning were seen to be logically or internally related (see Johansson, Marton and Svensson 1985). This means that the way in which learners engage in a task is inextricably related to what they learn from doing so. The relation is not between two separate entities. Rather, it is an internal or logical relation between two aspects of a single phenomenon, namely a learner engaging in a learning task. In the present study there was no attempt to measure process and outcome as separate entities but instead to explore the nature of the (internal, logical) relation between them (see Dall'Alba 1987).

The learning process was initially explored in terms of learning strategies. The learning strategies were seen as 'the questions and decisions of the learner relating to discrete steps or actions taken in performing a task' (Dall'Alba 1987, p. 5). Later, the approaches to learning adopted by the students were found to provide an integrating dimension to the strategy application, so that the role of individual strategies in carrying out the task became more evident when viewed in relation to the approach to learning adopted. The approach to learning was described in terms of deep and surface approaches (Marton & Säljö 1976a, 1976b; Marton 1983).

A critical feature of the study was that the learning strategies were identified and described in terms of the particular learning task and content. For example, in the heat transfer experiment, two of the strategies were 'predict next temperature reading from pattern of previous readings' and 'compare temperature readings with prior expectations'. (The definition of learning strategies in terms of the content contrasts with common practice in studies outside the phenomenographic tradition. In those studies, generalised learning strategies are typically the focus. For example, one of the learning strategies identified by Baird (1984) was 'define task and establish processing required', and Brown, Campione and Day (1981) discussed training learners in 'recall-readiness' and 'summarization' strategies.)

In the present study several sources of evidence for the learning strategies were used to maximise the completeness and richness of the data. These included reports by the student during the learning task, written observations by the interviewer while the task was carried out, the student's responses to specific questions of clarification during the task and discussion of a checklist of statements after the task was completed. The students were encouraged to describe what they were doing as they carried out each task. (Such a procedure is often referred to in the research literature as 'talk aloud' or 'think aloud'.) However, in the present study there was no assumption that the students' reports reflected the sequence of their thoughts, as is the case in many 'talk aloud' or 'think aloud' studies. Rather, the reports were obtained to determine how the students perceived each task, what meaning the performance of the task had for them, and the means by which they carried out the task.

Each session was taped and subsequently transcribed verbatim. Questions of clarification about what the student did or said during the learning task were raised where necessary to ensure that the interviewer's interpretations or observations were consistent with the student's perceptions and experience of the task. The questions were for-

mulated so as to avoid pre-empting the meaning which the task might have for the student. They included questions such as, 'What are you doing now?', 'Why are you doing that?', and 'What do you mean by that?' Wherever possible, the student's own words were used to avoid suggesting an interpretation that was not intended. The following interchange between a student (S) and the interviewer (I) occurred as the student carried out the experiment on heat transfer:

S. I was just thinking about what it [the temperature] will be this time, if it will be any surprises. I'm just thinking, I don't think that will go up too much more. If it does I won't know.
I. So that's the one with the white cloth that's been the highest?
S. Yeah.
I. You don't think next time it's going to go up much more?
S. No.
I. Mm hm.
S. I hope it doesn't because then my reasoning will be totally wrong.
I. How do you mean?
S. Well, I said the aluminium would go up the highest and so far—
I. Oh, I see.
S. That one hasn't gone up much.

Written observations relating to how each learning task was carried out were recorded by the interviewer and inserted into the transcripts. These observations provided supporting evidence for the application of particular strategies and allowed confirmation of the students' oral reports about what was being done.

A checklist of statements (based on Baird's (1984) evaluation strategies scheme) was constructed for each learning task in order to obtain additional and confirmatory data about strategy application. The experiment checklist included statements such as 'I thought about other things I know about heating or thermometers', and 'I thought about what the experiment was all about'. Each statement was specific and referred to an event that did or did not occur. When the students were engaged in the learning task, it was likely that their reports about what they were doing would be incomplete. Immediately after completing each learning task, the students selected those checklist statements that were applicable to their performance. They then discussed with the interviewer each statement that they had selected. The discussion of the checklist statements was directed to establishing when

particular events occurred, with the students giving specific examples. It served to clarify some of the students' own reports while carrying out the task, and to provide supplementary data about strategy application in order to enable the construction of an account that was as complete as possible.

When the task was completed, the students responded to questions about what they had learned. For example, at the end of the experiment on heat transfer, the students wrote answers to questions that required interpretation and application of the results, such as:

> Which thermometer showed the most rapid rise in temperature?
>
> Which material would be most useful in keeping a house cool in summer? Why?

Subsequently, the students discussed the responses to these questions with the interviewer. They also responded to questions relating to how they had approached and carried out the task, for example:

> What did you think you were being asked to do?
>
> What was the experiment about?
>
> What did you do in the experiment?
>
> What did the experiment show?

The use of several sources of evidence about strategy application enhanced the completeness and richness of the data but posed some difficulties in integrating data of different forms. For example, the students' reports about how they were carrying out the learning task constituted data about strategy application, as did their retrospective discussion of their performance and understanding of the task. A holistic approach to the data analysis was taken to minimise the difficulties associated with integrating the data. First, the various sources of data about the students' performance were considered in relation to one another. The emphasis placed on particular data varied according to the extent to which there was support from other sources of evidence. The emphasis was greatest where the supporting evidence was strongest. Second, evidence about strategy application was assessed and interpreted in relation to how the whole learning task was carried out. This evidence was not treated in isolation but as part of a total account of the student's engagement in the task. For example, indi-

vidual strategies which a student applied in attempting to understand temperature measurements in the experiment were interpreted with respect to the overall method the student used. The holistic approach to the data analysis facilitated the integration of the various forms of data.

The evidence for strategy application for each task reflected features of Marton's (1983) distinctions between the deep and surface approaches. Strategy application and approach were found to be closely related, with approach to learning allowing comparison of each student's performance across the four tasks. The data about strategy application and method of carrying out the task provided the basis for identifying the approach to each task that the students adopted. Evidence of learning outcomes was obtained from the responses to written questions about the content, discussion of those questions, and responses to more general questions about the outcomes of the task, such as, 'What did the experiment show?'. Across the four tasks, the relationships between the learning strategies, approach to learning and learning outcomes were explored.

Conceptions of learning in academic contexts

The second study I will describe deals with the phenomenon of learning itself (see Marton, Dall'Alba & Beaty 1993). This study extended the work of Roger Säljö (1979) in exploring conceptions of learning among students. The study to be described here was part of a larger investigation of students enrolled at the Open University in Britain. Other aspects of the research have been published elsewhere (Gibbs, Morgan & Taylor 1984; Taylor & Morgan 1986; Beaty 1987).

The study was longitudinal, beginning with twenty-nine social science students (eighteen women and eleven men) and tracing the views about learning of those students who remained enrolled in undergraduate courses for up to six years. The study's purpose was to further explore conceptions of learning within academic contexts, based on developments in phenomenography since Säljö's study, and to explore the extent to which there was development in those conceptions during undergraduate studies. Students were interviewed towards the beginning of their course of study, after the examinations at the end of their first year, and towards the end of each subsequent year that they remained enrolled. As in the study of learning strategies, the interview questions were framed in such a way that the student's own perspective was explored, for instance, 'Can you explain what you mean by that?' and 'Can you give an example?'.

The interview data were collected by Liz Beaty. During the interviews, the students also talked about events in their lives during the years they took part in the study, providing details about the context in which they were studying. This information about context afforded an illuminating background when tracing developments in their conceptions of learning (see Beaty, Dall'Alba & Marton 1997).

The interviews were transcribed verbatim and those parts that dealt with the students' views about learning were selected for analysis. The analysis of the interview data began when Ference Marton and I independently identified the conceptions of learning. We each wrote brief statements about what we thought was the focus of each conception. We had both identified six parallel conceptions of learning, although I was initially unsure about whether two of them (which we later called learning as increasing one's knowledge and learning as memorizing and reproducing) represented distinct conceptions or were manifestations of the same conception. I went back to the transcripts and established, through further discussion with Ference, that there were six distinct conceptions. It should be noted that Säljö had identified five conceptions of learning which corresponded to those identified in our study. In addition, we identified a higher level conception that was not evident in Säljö's data. We explain, in the paper referred to previously, why we think that difference occurred (Marton, Dall'Alba & Beaty 1993).

Following this initial discussion, Ference and I independently assigned the transcripts to particular draft categories. We began by discussing the interview transcripts from those students who had remained enrolled for several years. In discussing the categorisation of those transcripts, our focus was on determining the qualitatively different ways in which these students understood learning. This process occurred at two levels of analysis. First, we attempted to identify the conception of learning that was evident in each transcript and second, we sought to clarify the features of each conception by comparing and contrasting it with the other conceptions that were emerging. We found that the students frequently used rich metaphors to capture their understanding of what learning is, and we drew heavily on those metaphors in our early attempts to both identify and describe the conceptions. When we had agreed on the categorisation of many of the transcripts, we attempted to describe the most characteristic features of each conception, with constant reference to the transcripts.

A description of one part of this process may illustrate this. On one occasion we had two groups of transcripts which we considered to represent qualitatively different conceptions of learning. We agreed

that there was an emphasis on the meaning of the learning material in both groups of transcripts. However, when we attempted to characterise the differences, we were not initially in complete agreement. We both argued our case with reference to the transcripts. One argument put forward was that, in one group of transcripts, understanding the meaning of the learning material was only dealt with in the context of the course. In other words, learning was seen as occurring within, and relevant to, the course. In contrast, in the second group of transcripts, the meaning of the learning material was seen to have relevance beyond the course. What was learned in the course enabled the learner to see things in the world beyond the course. in a new way. This distinction—between an horizon which was delimited as the course versus the outside world beyond the course—was put to the test by systematically checking whether it was reflected in the two groups of transcripts. When the distinction was seen to hold, it was used in distinguishing the two conceptions of learning which, at a later stage in the analysis, came to be referred to as 'learning as understanding' (the learning material) and 'learning as seeing something (beyond the course) in a different way'. Furthermore, the distinction was found to be relevant to characterizing other conceptions of learning in the study.

At each stage of our discussions about what characterized each conception, we read the transcripts again, each time from a slightly different perspective as our initial understanding of them developed, but always with a focus on the conceptions of learning represented in the transcripts. We sought to formulate progressively more complete and refined descriptions of the six conceptions. As we did this, we continually sought evidence in the transcripts that was either consistent or inconsistent with our draft categories. This procedure was carried out for each transcript so that we always considered the transcript as a whole. In addition, we looked for commonality from one transcript to another within the same category. Through this process we jointly drafted categories of description based on the evidence in the transcripts. In refining these categories we engaged in a process of discussion that involved formulating or justifying each aspect of a category, referring back to the relevant transcripts as we did so.

In the later versions of the categories of description we took the analysis further by exploring 'what' and 'how' aspects, structural and referential aspects of the what and how, and internal and external horizons of the conceptions. We independently classified sixteen remaining interview transcripts that we had not previously discussed in order to test the precision of our categories (see Marton, Dall'Alba & Beaty 1993).

Assessing understanding in physics

The third study I will outline involved identifying and describing the qualitatively different ways in which physics students understand some fundamental concepts and principles in physics. These concepts and principles had been included in their prior studies in physics, and were fundamental to some major topics in their physics studies at the time of interview. The research team consisted of teachers of physics at the secondary school and university levels and educational researchers, some of whom had expertise in physics. The study is discussed in some detail in chapter 1 in this volume, so I will outline it only briefly here in order to discuss it in relation to the other two studies I have described.

In this study, thirty first-year students in two universities and sixty final-year secondary school students (Year 12) were interviewed about their understanding of particular concepts and principles of kinematics. Approximately equal numbers of male and female students from institutions of different types and across a range of academic abilities were included. These students responded to a total of fourteen physics problems. The problems were randomly assigned among the ninety physics students prior to interview, with each student answering four or five problems in an interview of approximately one hour. Hence, twenty-five to thirty responses to each problem were obtained. One of these problems that dealt with acceleration is shown here:

> A small steel ball, thrown up in the air, follows the trajectory shown. Air resistance is negligible.
>
> Discuss the acceleration of the ball from the time it leaves the hand until the time it approaches the ground

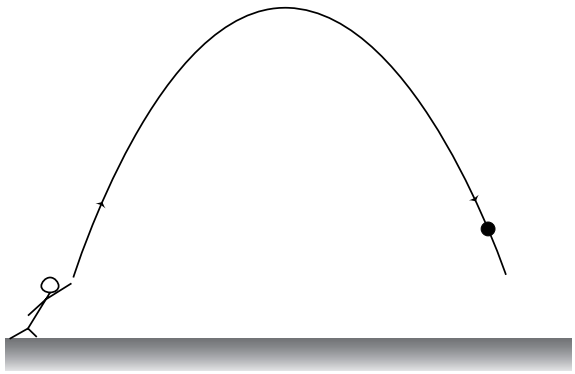

Figure 3: Acceleration

The problem was used as the basis for interviews about how students understand acceleration. The focus of the interviews was on exploring the students' understanding through questions such as, 'Could you explain that further?', 'What do you mean by that?', 'Why does that happen?'.

All of the interviews were audio-taped and transcribed verbatim. The process of analysing the transcripts phenomenographically will be outlined, using the acceleration problem as an example. This process began with one member of the research team reading all of the relevant transcripts with the purpose of identifying the ways in which the students understood acceleration in this problem. The different student understandings were used to form a draft set of categories of description. Each transcript was tentatively classified against the draft categories. Other researchers in the group independently classified the transcripts against the set of draft categories. The classifications of the transcripts were compared.

The researchers agreed that the draft categories represented the range of ways in which acceleration was understood, although they did not always agree about the way in which particular categories had been described. Any differences in classification pointed to the need to clarify and further elaborate the categories of description. Through an iterative process, the categories of description were refined on the basis of evidence from the transcripts about the students' understandings. This process involved continual movement between the emerging categories of description and the transcripts to establish consistency between the two. During this process the student's meaning was explored, taking the transcript as a whole rather than matching particular statements with specific categories. The characteristic features of each category were described with reference to the transcripts that were classified against the category. The final descriptions reflect these characteristic features of each category and the differences between categories (see Dall'Alba et al. 1993). In so doing, they reveal the relationship of one category to another.

How were these studies phenomenographic?

Each of the three studies described in this paper sought to describe the qualitatively different ways in which aspects of experience are understood, perceived, or conceptualized. For example, the study of learning strategies, approach and outcomes investigated and described the students' perceptions and experience of four learning tasks. In particular, it explored how they carried out the tasks, how they understood

them and what they learned from them. The study on conceptions of learning described the qualitatively different ways in which learning is understood in academic contexts. Similarly, the study on physics concepts and principles examined the qualitatively different ways in which concepts such as acceleration are understood.

The mapping of qualitatively different ways in which a phenomenon or aspect of the world is understood requires that a clear focus is maintained on what is being described. For example, in the learning strategies study, the students exhibited interesting reasoning patterns but these were relevant to the study only to the extent that they revealed the students' learning strategies or approaches to learning that the students adopted. In every aspect of the research the focus must be maintained. For example, each question raised during an interview must elicit some aspect of the understanding or conceptualization under investigation. Typically, a range of questions is used to provide views of each conception from several angles in order to make the description of the conception as rich as possible. For example, when their conceptions of acceleration were being investigated, the physics students were asked to explain what they meant when they used the term, acceleration. In addition, they were asked to describe both the acceleration and velocity of the ball throughout the path shown in the acceleration problem. They were then questioned further about how the velocity of the ball related to its acceleration. All of these questions focused on disclosing the students' conceptions of acceleration. Maintaining the focus of the research in collecting data in phenomenographic studies presents one of the challenges of this methodology.

The descriptions arising from phenomenographic research are relational, experiential, content-oriented and qualitative (Marton 1988, p. 181). These characteristics will be illustrated with reference to the three studies described above. The relational nature of phenomenographic descriptions means that the research focuses on the *relations* between what is experienced or perceived (for example, acceleration or learning) and who is doing the experiencing or perceiving (for example, physics students or Open University social science students). In other words, the ways in which the physics students understand acceleration, or social science students conceive of learning, provides the focus. As Marton points out, 'we try to describe an aspect of the world as it appears to the individual' (Marton 1986, p. 33). (The relational aspect of the phenomenographic approach can be seen to be related to Husserl's intentionality. However, the nature of the relationship has not been clearly delineated to date (see also Uljens 1992).

The relational nature applies regardless of which line of phenomenographic research a particular study falls within. For example, in the study of learning strategies, approaches and outcomes described earlier in this paper, the purpose was to explore these relationships by investigating how the students related to the tasks. The student's understanding of each task and how they engaged in it were described from their own perspective, that is, as it appeared to them. Similarly, the learning outcomes were described in terms of what the students understood from the task.

Drawing from Marton and Säljö's (1976a, 1976b; Marton 1983) and Ramsden's (1985) descriptions of approach to learning, it can be seen to consist of the following:

- the student's intention (to understand or to reproduce);
- the student's focus (on the task or learning material itself, or on its underlying purpose and meaning); and,
- the way in which the student engages in learning (organising and integrating, or simply memorising, the content of what is being learned).

Each of these aspects of the approach to learning is concerned with the way in which the student relates to the tasks in the study. The notion of approach to learning is itself, then, relational.

The relational nature of the other two studies described earlier is, perhaps, more immediately evident than for the learning strategies study. In the study of conceptions of learning in academic contexts, the focus was on exploring precisely what constituted the relation between the notion of learning and the students who described what they saw learning to be. Similarly, the physics students' conceptions of physics concepts and principles were relational.

In describing how a phenomenon or aspect of the world appears to an individual, it is necessary to adopt the individual's perspective, that is, to describe the phenomenon from the point of view of that individual. For example, in the study on learning strategies, it would have been possible to observe how the students performed each task without incorporating the students' own descriptions of their experiences and perceptions. Instead, the students' experiences and perceptions formed the greater part of the research data, supplemented by the researchers' observations. When a research study seeks to uncover the individuals' own views of an aspect of the world or how they function within that world, the perspective that is adopted may be described as experiential, that is, based on the experiences of the individuals. The experiential perspective is characteristic of phenomenographic

research and follows from the relational nature of that research. If we seek to describe the individuals' views, we must begin by listening to, and looking from, their point of view. This is adopting an experiential perspective.

In each of the three studies described in this paper an experiential perspective was adopted. In practical terms, this meant that what constituted the research data differed in form in each of the studies. As outlined above, in the learning strategies study, adopting an experiential perspective meant exploring how the students understood each task and what they did in carrying out the tasks, from their own perspectives. The approach to learning that they adopted and what they learned from each task were also determined from their perceptions and experiences of the tasks. The study was primarily concerned with particular content and tasks.

In the study on understanding in physics, particular tasks (or physics problems) provided the stimulus and context for exploring that understanding but were less central to what was being described than were the tasks in the strategies study. In the physics study the understanding of the concepts and principles underlying the tasks was the focus.

In the study exploring conceptions of academic learning, the students' experiences and perceptions comprised the research data. There was no single task or problem that provided the context, although the early part of the interviews was about courses of study that the students were engaged in. In this sense, the interviews about conceptions of learning may be regarded as less narrow in terms of context. However, the continual focus on the understanding of the phenomenon of learning is crucial in such a study, as it is in the more narrowly focused studies. If we are describing conceptions of learning, the data collection must focus on this.

Although the forms of data and narrowness of the focus varied in each of the three studies, in each case the students' perspective was the central feature of the data collection, analysis and results of the studies. The questions put to the students throughout the data collection in each study were deliberately formulated to be open-ended in order to allow the students to express their own perspectives and understandings. While decisions were made by the researchers about which phenomena, concepts or principles were to be investigated, the outer limits of what constituted each conception were determined by the views of the students themselves.

The content-oriented nature of phenomenographic research and descriptions arising from such studies also follows from the relational

nature of the research. As we seek to describe how individuals see an aspect of the world we must describe it in terms of its content, if the description is to be rich and meaningful. For example, we can only describe physics students' understanding of acceleration in terms of that content. In each of the three studies, the data collection, analysis and results were based on, and incorporated, the particular content being investigated.

As phenomenographic research aims to describe qualitatively different understandings, the descriptions arising from such research are qualitative. For example, the learning strategies study focused on the qualitative relationships between strategies, approach to learning and learning outcomes. The results did not consist of the number of strategies applied and the number of correct outcomes. The intention was to illuminate the nature of the relationships being explored. Similarly, in the studies of conceptions of learning in academic contexts and understanding in physics, the intention was to expose the nature of qualitatively different understandings and to demonstrate how different understandings of a phenomenon, concept or principle were related to each other.

I have outlined what is meant by the relational, experiential, content-oriented and qualitative nature of descriptions arising from some phenomenographic studies. However, these particular features of phenomenography are also applicable to other research approaches, such as phenomenology and ethnography (see Marton 1988). In contrast to these approaches, the focus of phenomenographic descriptions is on mapping qualitatively different conceptions.

Many studies outside the phenomenographic tradition include investigations about how people perceive or understand various phenomena. However, what distinguishes phenomenography is its focus. As Marton points out, most of these other studies can be distinguished from phenomenographic research on the grounds that in those other studies:

> the findings practically always have an instrumental function; they are instrumental in the sense that they are seen only as exemplifying some more general phenomena, such as how the human mind develops . . . What has not been realized, or at least not pointed out, is that the characterization of how people understand (or, rather, the characterization of the distinctively different ways in which they may understand) various phenomena, such as political power, the concept of number, or inflation, is of interest in itself (and not only as an example

> of something more general) . . . What I am arguing for here is that the mapping of the hidden world of thoughts about various aspects of the world around us should be recognized as a specialization in its own right. Such a specialization is of course complementary to other specializations. There are reasons for carefully describing the qualitatively different ways of thinking about various phenomena (this represents the 'phenomenographic knowledge interest'). On the other hand, there are also good reasons to account for what conditions may facilitate a transition from one way of thinking to another and qualitatively better one (Marton 1988, p. 180).

One of the features that distinguishes phenomenography is that the qualitatively different ways of understanding a phenomenon or aspect of the world are seen as a main outcome of the research. These different ways of understanding are typically presented in categories of description that are not predetermined but are drawn from the data. Even with those aspects of the research results that are not presented in the established format for categories of description (for example, the learning strategies and approaches to learning), the underlying principle of describing ways of thinking about and understanding a phenomenon or aspect of the world and presenting these findings as the main outcomes of the research is maintained.

What does phenomenographic research offer subject teachers and educational developers?

There is much that phenomenographic research has offered those who seek to improve teaching and learning. A principal feature of phenomenography that has relevance for subject teachers and educational developers is its emphasis on understanding. I will consider two of the more general benefits that follow from this emphasis. First, a phenomenographic perspective and the results of phenomenographic research can raise awareness that students (as well as subject teachers and educational developers) understand aspects of their world in qualitatively different ways. As we come to better understand other ways of seeing or understanding, we are more likely to be able to develop our own ways of seeing, and to bring about change in others' ways of seeing. Such an awareness can be developed by learning from the results of others' research (in our own and other subject areas), engaging in phenomenographic research, and listening to, and looking from, others' points of view, most particularly, the views of students.

This first benefit of phenomenography relates to a second, namely the insights brought about through seeing learning as change from one way of understanding to another, qualitatively more complete one. For example, through such a notion of learning we are encouraged as subject teachers and educational developers to investigate students' and our own understandings of the ideas we seek to develop. As we identify students' and teachers' understandings, we can determine where they can be developed. This provides a starting point for our attempts to bring about changes in ways of seeing or understanding. Having knowledge about current and desired understandings is likely to make teaching and educational development more focused and effective. It gives direction to our attempts to bring about change. It also provides us with a basis for establishing the extent to which we have been successful in encouraging changes in understanding. That is, it gives us an indication of the change we desire and whether that change has occurred.

Phenomenography continues to provide insights into teaching and learning. Its strength to date lies in the relevance it has for these processes. The challenge for the future is to maintain this focus on teaching and learning in ways that are relevant to practice.

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CHAPTER 7

The structure of awareness

Ference Marton

The point of departure for this chapter is the view that statements about pedagogy which are claimed to originate from research have to be seen in light of the methodology characteristic of the research from which they originate. Furthermore, it is assumed that methodological questions largely derive from, or are related to, ontological questions. Methodology refers in this context to how we research something and ontology refers to what it is that we do research about. And, of course, it seems to make sense that before we embark upon carrying out research we should know what it is we are going to research. However much sense this may make, it is nevertheless not always mainly, and hardly ever entirely, true.

Carrying out research about a phenomenon will reasonably tell us something about the phenomenon we are researching. The phenomenon is unfolding, so to speak, through the research process. Again, the extent to which this is true varies. It is very true, I would say, as far as phenomenography is concerned. During almost two decades we have done research about conceptions, experiences, views, perceptions and so forth, of phenomena, problems, situations, acts, events etc., without being very clear about what kind of entities 'conceptions of learning', 'apprehensions of children at play', 'understandings of understanding', 'perceptions of numbers', etc., are. In each case, we have been able to give a fairly precise answer about the nature of the specific entity investigated—in fact, this is what phenomenography is about. We have been able, for instance, to tell what different conceptions of learning there are (in a particular context), but we have not been able to say what a conception is. Because of this, phenomenography has been a rather elusive enterprise. We have been able to point to a comparatively large number of diverse empirical studies without being able to make explicit more than a few general principles.

Of course, this is consistent with phenomenography. As a matter of fact, the very label 'phenomenography' was chosen to convey the idea of describing various specific things as they appear to us (that is,

describing conceptions of various specific things) instead of formulating general principles about how things appear to us (which has, to a large extent, been the orientation of what has been called, 'the phenomenological movement'). Although I still think that the main strength and promise of phenomenography lies in a rigorous, empirical exploration of the qualitatively different ways in which people experience and conceptualize various phenomena in, and aspects of, the world around us, I believe that it is necessary to make general statements about the nature of the object of research. Without doing so, it is not possible to make explicit the criteria for what counts as phenomenographic research or to bring about a cumulative development of the research approach—theoretically, methodologically and substantively. As phenomenography is a fundamentally empirical undertaking, we should be able—with a reasonable degree of precision—to make explicit what we are trying to uncover in our research. In other words, we should be able to articulate what the categories of description are descriptive of. We should simply be able to point to the object of research in phenomenography. And this is exactly the question I am addressing in this paper: the non-dualistic nature of phenomenography.

Phenomenography as a research approach grew from attempts in the early 70s to understand academic learning better (for example, Marton & Säljö 1976). The point of departure was the seemingly rather straightforward observation that some students are better at learning than others. We wanted to take as little for granted as possible. Above all, we did not assume that we knew what 'being better at learning' implies, hence we decided to explore the meaning of the variation between students in learning. Furthermore, we settled for the idea that the best way of doing it was by trying to find out what kind of meaning the learning event (the situation, the task, the content) has for the students. We thus set out to study the learner's experience of learning.

After some years we arrived at a description where differences in the learners' understanding of the text they were reading, the problem they were dealing with, the lecture they were attending etc., were seen as representing the most fundamental aspect affecting students' learning. The learners' ways of experiencing the learning task and the learning situation—their approaches to learning—were seen as representing the most fundamental aspect of differences in learning. The act and the outcome were found to be two intertwined facets of learning, together illuminating the meaning of the variation between students (see Marton, Hounsell & Entwistle 1984). We can identify at least

three strategically important ways in which we framed the research enterprise:

1) We wanted to understand variation in learning;

2) Instead of applying a model of description defined in advance, we wanted to explore the meaning of the variation. We hoped to arrive at a way of describing the phenomenon of interest;

3) We aimed at finding the meaning of the variation in learning by studying the learner's experience of learning.

When doing research aimed at exploring what differences in learning mean, through the experiences of the learners, we face a fundamental ontological question: what kind of thing is an experience?[1] This is the question this chapter revolves around.

To begin with, an experience is necessarily an experience of something. In our case, this something is the text read, the problem dealt with or the very learning situation. We could think, for example, of a problem on the one hand, and the learners' different ways of understanding or experiencing it, on the other. It may appear reasonable to think that the problem is independent of the learners or of the different ways in which it is understood. Object (the problem) and subject (the learner) are two separate entities. The learner receives information about the object through his senses and forms a representation of the object. Experiences or conceptions are exactly these mental representations making up a subjective world corresponding more or less well to the objective world. Studying experiences or understanding of a problem means studying how 'the problem as such' is represented in the learners' minds.

This way of answering the question 'What kind of thing is an experience?' rests on a dualistic ontology: object and subject are separate. According to the non-dualistic ontological position in phenomenography, object and subject are *not* separate, the subject's experience of the object is a relation between the two. In this view there is, for instance, no 'problem as such'. A problem is always understood by someone, in some way; it does not have an independent existence.

[1] In our publications we have mostly used the word 'conceptions' but there are other synonyms appearing as well: perceptions, understandings, apprehensions, etc. In this chapter all the synonyms are used interchangeably; thus when using one of them it also stands for all the others.

From a non-dualistic ontological perspective there are not two worlds: a real, objective world, on the one hand, and a subjective world of mental representations, on the other. There is only one world, a really existing world, which is experienced and understood in different ways by human beings. It is simultaneously objective and subjective. An experience is a relationship between object and subject, encompassing both. The experience is as much an aspect of the object as it is of the subject. After all, the expression 'how the subject experiences the object' is synonymous with the expression 'how the object appears to the subject'. Phenomenography sees 'experience' ('conception', 'understanding', 'perception', 'apprehension', etc.) as a relation between subject and object, as 'something seen in some way by someone'. Although the relation is neutral to the distinction between object and subject, someone's way of experiencing something can be seen either in relation to others' ways of experiencing the same thing or to the same individual's way of experiencing other things. The former, which is in line with our original interest in variation between students, means stressing the object aspect; the latter, which would provide a more dynamic description of within individual variation or changes, means stressing the subject aspect. In the two following sections, these two ways of choosing the emphasis in phenomenographic research will be dealt with briefly both in general terms and by means of example.

What is a phenomenon? Above I argued that phenomenography rests on a non-dualistic ontology and hence contradicts the commonsense view that experiences are experiences of objectively and independently existing objects. Now, the thesis that an object of experience is not independent of the way in which it is experienced does not imply that the object is identical with the way in which it is experienced. A more reasonable idea is to see the object as a complex of the different ways in which it can be experienced. These different ways are logically related to each other, it is in this sense they are experiences of the same object. The logically structured complex of the different ways of experiencing an object is what has been called the outcome space of the object (see Marton 1981). 'Outcome space' thus turns out to be a synonym for 'phenomenon': the thing as it appears to us, which contrasts with the Kantian 'noumenon': 'the thing as such'. 'A way of experiencing something' is then simply one of different aspects together constituting that which is experienced. An experience of an object is thus not a subjective shadow of the real object, but a part of the whole which is subjective and objective at the same time.

Let us exemplify the above line of reasoning by drawing on Dagmar Neuman's (1992) recent study of how children in school,

who have not yet been taught how to understand and handle division problems, understand and handle such problems. This is thus a study of different ways of experiencing understanding, or handling something. This 'something' is thus the object which is experienced. Can we imagine what 'the object as such', which the experiences are experiences of, could be in this case?

The word problems Neuman used were the following:

a) Four boys have got twenty-eight marbles to share. How many marbles does each boy have?

b) Mum has baked forty-two buns. She puts them into plastic bags, six in each bag. How many bags does she need?

In a follow-up study the numbers were changed to give:

c) Seven boys sharing the twenty-eight marbles

d) and thirty-two buns of which four were put each bag.

Clearly 'the problem as such' can not be identified with a specific embodiment, with the black print on the white paper. Each problem could have an infinite number of physical embodiments: it could be printed in any (readable) style, in any colour, on any kind of paper and it would still be the same problem. It could be shown on an overhead projector, on a computer screen; it could be read, even sung and still remain the same problem. Neither can the problem be identified with the specific linguistic expression: it could be translated into any language and it would remain the same problem. One could argue, of course, that it is exactly the sense, the meaning of the problem, which is invariant through the linguistic transformations; hence this sense or meaning is what defines 'the problem as such'.

In relation to this, one may raise the question, however, whether or not meaning always assumes a subject, someone who understands it. If we answer this question in the affirmative it implies that we do not define the problem in itself but 'the problem as understood (by someone)'. Furthermore, 'the problem to be translated' does not necessarily (or presumably) carry the same meaning as 'the problem to be solved'. And it is definitely the latter sense that we are interested in.

Of decisive importance is also the fact that Neuman did not try to describe conceptions of specific problems, but she was interested in

describing conceptions of division in general and she used four different problems in two separate studies. So what is it that she described conceptions of? We can, of course, define division mathematically as the inverse of multiplication—we know the product of two factors and one of the factors, and we are looking for the unknown factor. This is, of course, one way of understanding word problems on division, but it is surely not the only way of understanding such problems. As it should be obvious from what follows, it was not problems of this kind that most children in Neuman's investigation were addressing (in terms of their understanding of the problems). This is actually the main point I am driving at: we have to find out empirically what problems the children are addressing and this is exactly what the phenomenographic approach is all about.

A central issue in the field investigated by Neuman offers an example. There has been a long debate about whether division is actually one or two kinds of operations. A distinction is often made between partitive and quotative division. In the former—illustrated by problems (a) and (c) above—we know the whole and the number of parts, and one has to find out how large the parts are. In the latter—illustrated by problems (b) and (d)—the whole and the size of each part is given, and one has to find out the number of parts. Neuman's investigation, in fact, throws light on the issue of whether division should be regarded as one kind of mathematical operation or whether the distinction between the two forms should be maintained. Most of the children understood all the problems in terms of proportional reasoning (which was expressed through a number of different ways of handling the problems). They simply built on the constant relationship between buns and bags in problems (b) and (d), for example, six buns–one bag, twelve buns–2 bags, and so on; and between the number of marbles distributed and the number of marbles received by each of the boys in problems (a) and (c); for example, four marbles—one marble per boy, eight marbles—two marbles per boy, etc. This means that, in problems (b) and (d), these children followed the structure of the problem by distributing the quantity mentioned in the problem, six (four) buns at a time. In problems (a) and (c), they transformed the problem by distributing a quantity not present in the problem, four (seven) marbles at a time.

Neuman argues that the proportional understanding of division problems—both of a partitive and a quotative kind—has a developmental potential. By using repeated operations (addition, doubling, etc.) the children are facing the need of keeping track of the number of times the operation has been used. This means that, in addition to

carrying out the operations, they would need to carry out an operation on the operations (keeping track of them). The children are thus forced to get around the difficulties with keeping track and they do it by developing gradually greater units (for example, doubles, squares, multiples of five and ten, etc.), and in the end they thus master the multiplication table. About one third of the children did not understand the partitive problems in terms of proportional reasoning, but in terms of dividing up. They were reluctant to find out the number of marbles each boy got by finding out the number of times four (seven) marbles were distributed. They wanted to know the size of each part directly. This is easily done if you have already mastered the multiplication table, but quite difficult without. They did it by repeated halving, by distributed division (for example, dividing twenty by four first, and eight by four afterwards, and adding together) or by guessing. Neuman argues that this way of understanding division problems, although it mirrors more closely the structure of partitative division problems than the proportional understanding, lacks developmental potential. The ways of dealing with division problems that originate from a 'dividing up' kind of understanding of them are unrelated to each other, confined to specific cases or simply too cumbersome to use. According to Dagmar Neuman's results, however, most children spontaneously develop a proportional understanding of division problems with a developmental potential, which is identical for partitive and quotative problems, but which differs from the full-blown mathematical understanding of division.

The point I wanted to illustrate with this example is that the object of experience or understanding can not be defined independently of the way in which it is experienced or understood. In actual fact the different ways in which the object (in this case, division problems) is experienced or understood together constitute the object. According to Neuman's results, the important difference in elementary arithmetic is not between partitive and quotative division, but between a proportional and a 'dividing up' understanding of division. These two types of understanding are some of the possible ways of experiencing division, which together constitute the phenomenon of division.

As was mentioned above, the previous section represents a focus on the object aspect of experiences. Different experiences of the same object were related to each other: thus constituting 'the outcome space' of the object, tantamount to the phenomenon, to the object as it is experienced in different possible ways. If we want to understand

how learning is taking place, we have to focus on the subject aspect of experiences. After all, it is always an individual who learns.[2] A focus on the subject means that, instead of relating someone's experience of something to other people's experiences of the same thing (as we did in the previous section), we relate someone's experience of other things. The question is thus: is a person experiencing different things simultaneously and if she is, is she experiencing them in different ways? The totality of a person's simultaneous experiences, her relatedness to the world, I will call her awareness. The term 'awareness' is used interchangeably with the term 'consciousness'.

A decisive difference between the way in which these terms are commonly used and the way in which they are used here is that the usual, dichotomic sense of the term is replaced by the idea of the structural differentiation of awareness. We are used to thinking of consciousness as opposed to unconsciousness (or to the subconscious), awareness as opposed to unawareness. We may think that we are aware of one thing or a few things at a time and all other things are—for the time being—outside of our awareness. From the point of view of information processing psychology, one may relate awareness to primary memory or short term store, as:

> . . . a rather small amount of . . . highly activated, readily available information which is kept alive in the mind—or held in consciousness—while the person is actually making use of it, and which fades out of consciousness or is replaced by new information quite rapidly as soon as the person stops using it (Carr 1979, p. 124).

Now, even a very limited use of the phenomenological method in the Husserlian sense, that is, as the reflection on our way of experiencing things—for instance, the very situation we happen to be in—should be sufficient to convince us that the idea that we are aware of one thing at a time is incorrect.

As an example, let me envisage a reader of the present text. When reading this very line she is aware of the topic, she is aware of what kind of book this is a chapter of, she is aware—at least to some extent of—of the line of argument preceding the actual line she is reading. She may have some previous experience of the topic of chapter of the book, and, to the extent it is true, her previous experiences forms a

[2] At least in the original sense of the word. We can, of course, conceive of learning also on the collective level. Organizations, communities, nations, etc., can, no doubt, learn as well.

background for her present reading. She is aware why she is reading this chapter, how she feels about it while reading it; she is also aware of who she is, where she is sitting, what time of the year and of the day it is, what she is going to do during the rest of the day. She is aware of her own name, whether she is married or not, if she has any children, if her parents are alive, etc., etc. Although she is aware of innumerable things simultaneously, she is certainly not aware of everything in the same way. Our awareness has a structure to it. Certain things come to the fore, they are figural, they are thematised, while other things recede to the ground, they are tacit, they are unthematised. And again, there are not two categories: figure-ground, thematised-unthematised, explicit-implicit. There are different degrees of how figural, thematised, and explicit things or aspects are in our awareness. When reading the text thus, hopefully, but not necessarily, the meaning of the text is in the focus of awareness. While reading the text things that are related to its content come to the fore in the reader's awareness.

Gurwitsch (1964) makes a distinction between the object of focal awareness, the theme, and those aspects of the experienced world which are related to the object and in which it is embedded, the thematic field. In the present example, the text is the theme and issues such as pedagogy, phenomenography, phenomenology and questions of qualitative research methodology in general, belong to the thematic field. The same theme can, of course, be seen against the background of different thematic fields. Furthermore, there are things that coexist temporally and spatially with the reading of the text, such as the room where the reader is sitting, the reader's marital worries, etc. All that coexists with the theme, without being related to it by dint of the content or meaning, Gurwitsch calls the margin. Awareness has a particular structure also as far as the theme is concerned. The theme appears to the subject in a certain way, it is seen from a particular point of view. The specific experience (or conception) of a theme—or of an object, to keep to our earlier terminology—can be defined in terms of the way in which it is delimited from, and related to, a context, and in terms of the way its component parts are delimited from, and related to, each other, and to the whole (see Svensson 1984).

Neuman (1992) identified different forms of the proportional understanding of division, described above. For instance, younger children often solved problem (b) by relating it to the concrete context of actually putting buns in plastic bags. This was done in either of two ways. They could draw one bag at a time and put six buns in it, draw the next bag and so on (addition), or they drew forty-two buns

and then circled six at a time (subtraction). The fine structure of awareness differs in the two cases. In the first case, the plastic bags with six buns in each are the primary focus and the movement in the solving of the problem is towards the whole, the forty-two buns: this means reversing the direction implied by the formulation of the problem. In the second case, the whole, the forty-two buns, is the object of primary focus and the movement in the solving of the problems is towards the plastic bags, in accordance with the way in which the problem is formulated. In Neuman's study, the difference between these two ways of understanding problem (b) seems fairly subtle, although one could perhaps argue that the reversal of the direction of the problem as given foreshadows the insight about the irrelevance of the specific content (as compared to the relations between numbers) in mathematical problems. More obvious, however, is the difference between these two ways of understanding the problem and the next.

A boy in grade 6, Mattias, started with '6 x 8' and subtracted 6. He explained that he knew that '6 x 7' is 42 because '7 x 7' is 49. Mattias delimits the problem as a pure arithmetic problem and related it to the class of problems with numbers (delimiting and relating are two aspects of the same act of awareness). He is taking '6 x 8' as his point of departure, presumably because he happens to know that 6 x 8 = 48 and because he tacitly knows that he can get to 42 from 48. Here we can envisage him thinking of taking away a 6-unit, that is, a bag with six buns. In that case, the problem is still not purely arithmetic. But he points to an alternative path to get to 42, namely taking the square of 7 as the point of departure and subtracting one '7'. This move is very difficult (although not entirely impossible) to interpret in terms of the concrete entities mentioned in the problem. In all likelihood, Mattias is here just dealing with numbers and with relations between numbers. Above all, he seems to understand the problem of division in terms of the factorial structure of numbers, which gives him great flexibility in using alternative operations and principles to get the answer.

This brief discussion of some details in Neuman's work was phrased in terms of children's differing understandings of a specific problem. However, Neuman was interested in the different ways in which children may understand division in general. In the previous section we discussed how—by studying the different ways in which children understand specific division problems—we can map the different ways in which children understand division in general. But what kind of conclusions can we draw concerning a few children's understanding of division in general when investigating their under-

standing of specific problems? Without being able to address such questions we can hardly discuss questions of learning such as 'what does it take to develop an understanding of division?'. When a child understands a specific division problem in a certain way, she demonstrates that she is capable of understanding division in that way. Whether or not she will understand other division problems in the same way is an empirical question that can be illuminated by examining the nature of the understanding and by letting the child deal with other division problems.

Although Mattias is tacitly aware of the fact that it is buns that have to be put in plastic bags, what is figural in his awareness when dealing with problem (b), is the factorial structure of 42, the factorial structure of 48, the square of 7, etc. He is capable of understanding division as the inverse of multiplication, hence he is capable of understanding division in terms of the factorial structure of the divident. Judging from the fact that his understanding of the specific problem in terms of the factorial structure of the divident was based on his knowledge of 6 x 8 = 48 and 7 x 7 = 49, he would probably not be able to understand some other division problems as inverted multiplication but as, for instance, repeated division. When we probe his understanding of division, we necessarily do it under certain specific conditions and his understanding of division we can only explore as an aspect of his understanding of that specific situation. And his experience or understanding of all the different details or aspects constitute his understanding of the situation as a whole.

Developing the mastery of division reasonably implies that division problems are understood in terms of the factorial structure of numbers, regardless of other aspects of the situation. Now, what does developing such a capacity—or developing any capacity of understanding something in a certain way—mean? What does it take to learn in this sense of the world? The common idea—held by laymen and psychologists—is that a capacity is developed in the individual and is stored in his head in the form of a scheme, or some form of internal representation, which is applied to different relevant cases. This idea of the development and use of capacity rests solidly on a dualistic ontology—subject (the learner) and object (the situation or problem handled) are separate and independent entities. This means that, according to the present line of reasoning, one is running into logical contradictions and difficulties, some of which have been mentioned earlier.

Let us here mention one difficulty with this dualistic model of understanding. Something (for example, a division problem) is understood in a certain way because a scheme or some internal

representation that is stored somewhere in the long-term memory is applied to that something (for example, to the division problem). Now, in order to retrieve the tool (the scheme or the internal representation), it has to be searched. But how does the system know what to search for before the object has been made sense of by using the tool? I believe a non-dualistic alternative has to be based on the view of awareness, introduced earlier, that is, the structural differentiation of awareness. The subject is aware of the object in a certain way, the child is aware of the problem as a division problem or a problem of the factorial structure of numbers. The problem does not exist as such, it is always understood in one way or another. The way of understanding a problem is always in the awareness; the new problem is understood in terms of the subject's previous relevant experiences present in awareness. And as awareness is always the awareness of something, it is a fundamentally internal relation. But what does a statement like 'The way of understanding a problem is always in the awareness' imply? How could we possibly conceive of all our previous experiences being present in awareness? The idea quite obviously violates our commonsensical beliefs about the nature of awareness. As was mentioned above, awareness in the present context does not refer to one side of the dichotomy aware—unaware or conscious-not conscious—but it denotes everything that is experienced simultaneously in whatever way it is experienced.

It was pointed out above that there is practically always an object of our focal awareness, what Gurwitsch (1964) calls a theme. This theme is experienced against the background of the thematic field to which it belongs. Furthermore, we also experience—more or less vaguely—things which are unrelated to the theme but coexistent with it in space and time. We call this the margin. All that belongs to the theme, the thematic field and to the margin, we experience simultaneously in widely varying ways. Awareness has a structure. Also the experience of the object of focal awareness was dealt with earlier in terms of how it is delimited from and related to a context, on the one hand, and how its parts are delimited from and related to each other and to the whole, on the other hand. The former we call the external horizon and the latter the internal horizon of the object (see Marton, Dall'Alba & Beaty 1992).

Now, the term 'internal horizon' is used in a somewhat different manner in phenomenology (see, for instance, Gurwitsch 1964, p. 237). The examples used in descriptions of phenomenology as the philosophical study of human experience are often about the perception of material objects. A fundamental aspect of our experience of

things is that we experience far more than what is given through the senses. When looking at a green apple lying on the table we do not only experience the side of it which is turned against us, but we experience its continuation: the back- and underside, which we actually do not see. We even 'see' its weight and its sourish taste etc., etc. We simply experience an apple with its many different aspects. If we interpret 'parts' in our definition of internal horizon so that it includes aspects 'appresented'(which appear experientially without being given through the senses), and if we also consider 'ideal objects'—such as concepts, principles, theories, problems, stories, etc.— in addition to material objects, we find that the internal horizon of that which we are aware of refers to all the different possible appearances of an object which together constitute the object—to the extent and in the specific manner in which they show themselves from the subject's specific perspective. Differences in the external horizon correspond to differences in the internal horizon as the specific perspective also implies a specific delimitation from, and relating to, the context. It is thus the individual experience of something that has internal and external horizons, but in the horizons other possible ways of experiencing the same object are present. The external horizon of an object, a theme (such as a division problem, for instance) encompasses the thematic field and the margins as well. The field is related to the theme by the dint of relevance. In the case of a division problem numbers, the number system, arithmetic operations etc., etc., belong to the field, which is present in a tacit way in awareness. The field is not finite, there is indefinite continuation of less and less determinate relations of relevancy (Gurwitsch 1964, p. 380).

Awareness thus extends indefinitely as far as conceptual relations of relevance are concerned. But also in space and time there is an indefinite extension in the sense of the subject's awareness projecting into the future, both in the sense of, for instance, aiming at a solution of the problem they are dealing with (thematic field), and in their expectation of things that are going to happen outside the context of problem-solving (margin). In a similar way, past experiences are present in the sense of the subject being aware of what has happened before. The subject is also aware of his situatedness spatially, and the world surrounding the situation may or may not be experienced as indefinite. This line of reasoning is supposed to suggest that what surrounds a specific experience, what is its external horizon, is the individual's total experience of the world. In this sense we are aware of everything all the time. But we are definitely not aware of everything in the same way. Again, awareness always has a structure and we are

always aware of the world from the point of view of a particular situation. At the same time, every situation is seen through all our experiences of the world. Learning in the sense of becoming capable of understanding something in a certain way means changing one's way of being aware of that object. But this very change will always be seen from the point of view of constantly varying situations.

Finally, a concluding remark. This paper is based on the view that pedagogical questions rest on the methodology used to illuminate them, and that methodological questions are contingent on ontological commitments. My aim has been to demonstrate that phenomenography rests on a non-dualistic ontology and that only through this realization can we clarify what kind of entities experiences, conceptions, understandings are. The point I was trying to make was that experiences, conceptions, understandings, etc., (terms which I have used interchangeably) refer to subject-object relations of an internal nature. Our world is a world which is always understood in one way or in another, it can not be defined without someone defining it. On the other hand, we can not be without our world. Still, we can focus on the object or on the subject aspect of the subject-object relations that experiences are. When focusing on the former, we concluded that an object is the structured complex of all the different ways in which it can be experienced. When focusing on the latter, we concluded that we always aware of everything, although the way in which we are aware of everything is situationally variable. Both conclusions may seem highly counter-intuitive. And still what they imply is that we should explore—without too many preconceived ideas—what the world we experience is like, on the one hand, and what our way of experiencing the world is like, on the other hand. And of course: these are not two things. They are one.

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CHAPTER 8

Exploring conceptions: Phenomenography and the object of study

Kate Patrick

This chapter describes how I drew on phenomenography in my doctoral research (Patrick 1998): why it seemed appropriate, how it related to the other analytical methods which I adopted, how I used it, and what I learnt from the process.

Purpose of research

Underlying my research was a question about the differences in outcomes which are achieved by students in different classrooms. I was particularly intrigued by the results of a research project led by Paul Ramsden: the Adaptation to Higher Education project (cf. Ramsden, Patrick and Martin 1988). Ramsden found that classes in different schools differed in terms of the students' characteristic approaches to study, their perceptions of the learning environment, and their Year 12 examination results. While overall his study showed the expected association between students' approaches to study and their examination outcomes, one particular contrast puzzled me. Among the students who scored high on Biggs' Deep Approach scale were students in an elite girls school, and students in a working-class girls school. It appeared from their responses that both sets of students aspired to understand the material they were learning at a deep level; but while the students at the elite school got very good results in the end of year external examinations, the students in the working-class school performed badly (on average they failed). Why did they perform so differently?

I thought it would be worth exploring what students actually did in class—what they were taught and what they learnt. Hence my doctoral project which investigated the relation between what is taught in classrooms (the 'object of study') and what students learn.

I interviewed a number of Year 12 teachers (eighteen teachers of physics, fifteen teachers of Australian history); observed some of them in the classroom over two to three terms (an average of twenty-five lessons); and collected data from their students at the beginning and end of the observation period. I considered:

- how teachers described what they were teaching;
- what they said in class, and the tasks they set their students;
- how their students responded to tasks in the discipline, at the beginning and end of the year;
- how the students described their classes, their own learning, their aspirations, and the subject itself.

At the time, Year 12 study in Victorian schools was assessed only by an external examination; the teachers I interviewed were all following the same curriculum and working to the same assessment requirements. Figure 4 depicts this methodology.

Relevance of conceptions

At one level, this study can be seen as an exploration of the production of discourse, through characterising and analysing differences in how the same curriculum was rendered in different classrooms. Certainly the analytical strategies I used represent different ways of approaching the analysis of discourse. Phenomenographic analysis seeks to characterise the conceptions which are implicit in descriptions of a particular phenomenon (Marton 1981), descriptions which as Säljö has pointed out are only available to us in discourse (Säljö 1997). The set of practices which constitute discourse analysis have been defined as the analysis of language; its:

> themes, styles of statements and . . . objectives . . . Discourses articulate the world in certain ways: they identify 'problems', perspectives on those problems and thus 'solutions' (Fulcher 1989, pp. 4, 8).

I used discourse analysis to develop an account of the relation the teachers established between their students and the object of study. I used a phenomenographic approach to analyse teachers' and students' apprehensions of what was to be studied (the 'object of study'), and students' conceptions of specific physical or historical relationships.

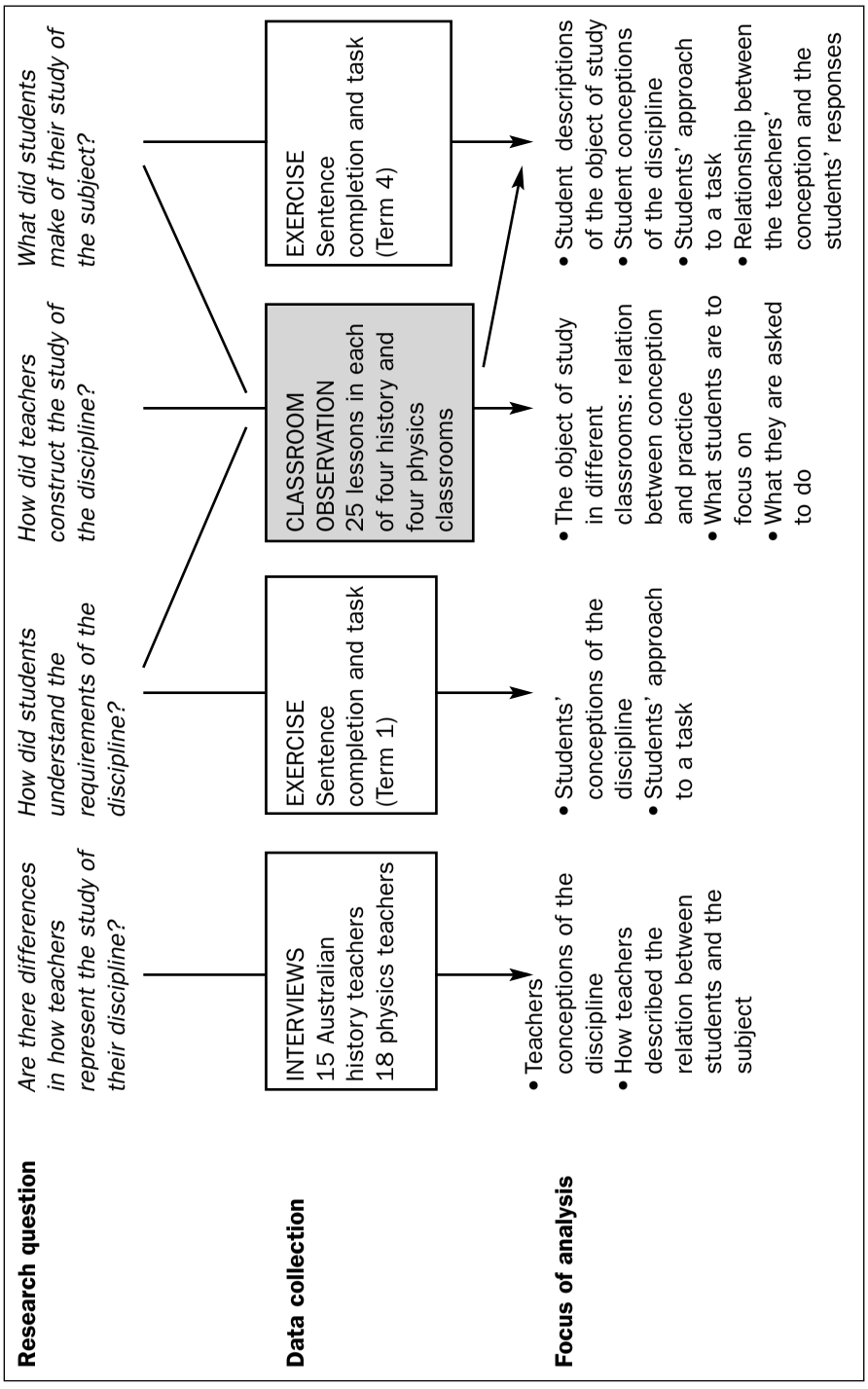

Figure 4: Methodology

The project fell into three stages: first, identifying differences between teachers' discourses in relation to their subject; second, tracking teachers as they engaged their students in discourse in the classroom; finally, analysing the discourse of the students in relation to what and how they were studying. Each of the stages of this work involved methodological decisions and iterations through analytical processes. Tables 2 and 3 list the analyses I undertook, and the broad approach adopted to each analysis.

Table 2 Analyses and analytical approach: Teachers

Source of data	Focus	Approach
Interviews	study of discipline	Phenomenographic
Interviews and observation	positioning of students in relation to discipline	Discourse analysis
Observation	learning of subject—positioning of students and teacher (dominant metaphor, grammar of interchanges)	Discourse analysis
Observation	tasks set for students, use of resources	Discourse analysis

Table 3 Analyses and analytical approach: Students

Source of data	Focus	Approach
Sentence-completion exercises	study of physics/Australian history	Phenomenographic
	perceptions of lessons	Discourse analysis
Written task	**(physics students)** approaches to each of four physics problems	Phenomenographic
	force and motion (Box context)	Phenomenographic
	force and motion (Two Boats context)	Phenomenographic
	(history students) character of an historical account (two exercises separately)	Phenomenographic
	relation of historian to historical account (two exercises separately)	Phenomenographic

Underlying the different stages of this work was my expectation that a teacher's practice was likely to be intelligibly connected with the account s/he gave in the initial interview: that the language in which

the teacher described the discipline, and the verbs s/he used to characterise students' relation to it, were likely to be recognisably connected with the discourse and tasks which s/he established in the classroom. Phenomenographic analysis captured the different conceptions which teachers and students expressed; tracking the dynamic discourse of the classroom enabled me to show how the teacher actively positioned students in relation to his/her particular conception of what was to be studied. This meant I was able to connect the apparently static phenomenographic analysis of abstract 'categories of conception' into the dynamic process whereby students were positioned in classroom discourse, brought to focus on particular questions, asked to respond to particular tasks; in short, to engage with the object of study which the teacher constructed for them.

Why this methodology?

What were the experiences which led me to adopt this methodology?

Initially, in fact, I did not have in mind a strictly phenomenographic analysis. I was interested in the language the teachers used and what it communicated about what they actually did. In my first round of interviews, with thirty-odd teachers, I asked the teachers to describe what they taught. I focused on the details of teaching: how exactly a recent topic had been introduced, what the teacher had done, what the students had been expected to do, and what issues they had encountered. In doing this, I was chasing evidence of practice and language which expressed the teachers' 'practical knowledge' (cf. Bourdieu 1977/1972, pp. 18–21). In the terms provided by Argyris and Schön (1978), 'discursive expression' and public statements of principle and declared policies correspond to 'espoused theory', while the private, spontaneous and automatic decisions of 'practical consciousness' are informed by 'theory-in-use' (cf. also Giddens 1984). Theory-in-use, as studied within the metaphor/teacher images literature, is expressed by the metaphors we unconsciously use in describing what we do (see for example, Lakoff & Johnson 1980, Lakoff 1987, Johnson 1987, Johnson 1989, Munby 1986, Russell & Johnson 1988). I expected that the teachers' descriptions of their practice would help me understand what they did in the classroom.

This approach offers insights based on the underlying commonality between different metaphors. Munby calls this commonality a 'framing metaphor'. It is assumed that metaphorical representations with a common focus also have a common character, because they represent the individual's sense of his/her relationship with whatever

the focus is, even though the individual may not be aware of it. The researcher's task is to interpret what the teacher says by identifying and articulating these underlying tropes or framing metaphors. The notion of a framing metaphor implies that what is taught can be understood as a gestalt, an intelligible whole; that there is a commonality in the way the teacher presents different topics and gets students to deal with them. This commonality is discerned from what teachers say about what needs to be learnt. The themes they pursue in describing their practice are intelligibly related to what they say in class, and what they ask students to do. Analysis of metaphor thus uses the language of the individual teacher to develop an account of what the teacher does.[1]

However, while the analysis of metaphors seemed a useful way of identifying how teachers represented students' learning, and their relationship to the curriculum, it seemed less promising as a way of gaining insight into their representation of the subject content itself. The framing metaphors which Munby and Johnston and Russell identify indicated active relations ('covering the curriculum', 'getting started quick', 'stepping back and looking at myself'). These are the bodily metaphors which are so frequently incorporated into everyday speech (see Lakoff 1987). These teachers were using metaphor to represent their own role as teachers, and their relationship with children as learners in their classroom, rather than curriculum content. Maintaining the idea that their descriptions of their practice were likely to give clues to the representation of curriculum they develop in the classroom, I felt I needed an approach which incorporated more of their discourse in the analysis. This is where I turned to phenomenography.

Marton (1988a) puts forward the view that understanding is a critical element of knowledge, and that changes in understanding constitute the most significant element of learning. He argues that differences in how we understand a phenomenon are visible in what we notice about it and how we see its parts as being related—'what aspects, what parts, what relations are discerned and focussed on' (Marton 1988a, pp. 3–4). To illustrate this idea, he uses the metaphor

[1] It therefore stands in direct contrast with analyses which classify teachers' practice into externally generated categories such as 'transmission' or 'understanding-oriented'. The metaphor of transmission, particularly, has been used by researchers to connote both a belief in 'knowledge as fact' and an expectation that teaching is a fairly simple process of transferring knowledge from teacher to learner. These ideas are recognisable, but they are rarely shared by the researchers who categorise teachers as 'transmission' teachers, so that the term actually becomes pejorative rather than illuminating.

of figure and ground: looking at the same picture, different people discern different figures, and construe differently the background against which the figure appears (personal communication). Marton used this idea to analyse different ways in which students apprehend, or understand, the same phenomenon, but the principle of his work is clearly applicable to the analysis of what teachers say about their practice. The underlying idea is that the salient features of a phenomenon—what we focus on when we talk about it—constitute what is important about it for us in that particular context. Thus when a teacher talks about a subject s/he teaches, s/he gives it a particular shape, by focusing on particular aspects of the subject—those which are salient to him/her—and by presenting these aspects within a particular frame of reference. The focus the teacher gives the work is the figure, and the frame of reference s/he uses is the ground.[2]

As an analytical procedure, phenomenography has something in common with the process of identifying dominant metaphors, as used by researchers such as Munby. Both Marton and Munby emphasise the importance in the initial investigation of developing the analysis from the data, rather than trying to match observations to a pre-specified set of categories. Both emphasise the importance of attending to dominant features of the discourse they are analysing. A significant difference, however, is the focus of the analysis which results. Munby, like Russell and Johnston, characterises how particular individuals represent what they are doing. Marton's is a 'second-level' analysis: he seeks to develop categories of representation, grouping together like ways of representing a particular phenomenon. This makes it possible to go further than the individual case, to recognise common ground in the ways different teachers talk about their practice. Expressing this in terms of discourse theory, we might say that a phenomenographic analysis helps us to see that what teachers say is not purely idiosyncratic; rather, the teachers are participating in different discourses.[3]

What particularly drew me to the phenomenographic approach was the work of the Conceptions in physics group, based at the University of Melbourne. I participated in meetings where the team worked on analysing the conceptions evinced by students' responses to a number of physics questions (see Bowden et al. 1992, Dall'Alba et al. 1993, Ramsden et al. 1993, Walsh et al. 1993). Ference Marton

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2 cf. also Marton (1981), for an early formulation of this approach, and Marton and Booth (1997) for a recent overview.

3 cf Hollway in Henriques et al. (1984).

was a contributor to these discussions, and also presented seminars about the phenomenographic approach. I was interested in his notion of 'figure' and 'ground', and tried it out when I came to analyse my first pilot exercises. I found that identifying what students focused on in their responses was heuristically powerful. I had already begun interviewing teachers about their subjects; the semi-structured interview schedule I was using yielded material which I found could also be analysed using a phenomenographic approach.

So what were the implications of taking a phenomenographic approach to this project?

Collecting the data

As Tables 2 and 3 suggest, I used a phenomenographic approach to analyse both my interviews with teachers and the exercises undertaken by the case-study students.

Interviews with teachers

In exploring the teachers' conceptions of their discipline, I wanted to go beyond the individual, and to identify some ways of talking about the discipline which a number of teachers shared. For this purpose a phenomenographic approach seemed appropriate. Elements of discourse—'conceptions', in Marton's terminology—are not purely idiographic; they are constituted in shared ways of talking. If my interpretation of what teachers had to say was to develop into an account of the discourses they used, I needed to do more than work up detailed accounts of the histories of individual teachers. I decided to use my interviews to develop a set of phenomenographic categories, different ways of representing the study of physics and history, and to follow the interviews with classroom observation of teachers who spoke about their practice differently. This meant interviewing a number of teachers, so that differences and commonalities in what they said could become visible.

As I have said, the first stage of the research involved open-ended interviews with thirty-three teachers: fifteen teachers of Year 12 Australian history, and eighteen teachers of physics. I approached these teachers individually. I did not try to achieve a random sample, but to cover a reasonably wide range of school types and settings: single-sex and co-educational, government and non-government private, in wealthy, middle-range and lower status areas. In several larger schools with two or more physics or Australian history teachers, I interviewed two teachers rather than one.

In these interviews, my main purpose was to ask teachers about their practice in relation to the particular subject. I began each interview with the same questions, about the study of the subject: 'What would you say that the study of Australian History/Physics at Year 12 is about? What would you most want your Year 12 students to carry away at the end of the year?' The rest of the interview was semi-structured: each interview covered similar ground, and I asked much the same questions. I was aiming to keep the interview as open as I could to the teacher's own view of the subject and their students' learning. Since the interviews disclosed quite considerable differences, I think I was reasonably successful in doing this.

Classroom observation

In the case study phase of the project, I observed four Australian history and four physics teachers teaching Year 12 classes. I selected these teachers because their descriptions of what they were teaching, and how they went about it, suggested that there would be substantial differences in what their students experienced. I was not convinced that I understood the teachers' perspectives and their work merely on the basis of my interviews with them. I felt it was important to follow up by observing the teachers in the classroom and by exploring their students' responses to their teaching. Looking back, I would say that the classroom observation was actually the central part of the study; I would almost say it enabled me to hear what the teachers were saying in the interviews. I can still recall the moment when, after observing one teacher's lessons for weeks on end, I suddenly recognised what he had meant when he described what he was doing.

In my classroom observation, I tried to be alert to the focus of attention in the class—of both teacher and students—and I watched out for moments when the teacher redirected students' attention, or indicated that some particular question or idea was outside the scope of the class. Though in the end I did not use a phenomenographic approach to analyse my observations, I was very consciously using the notion of figure and ground which I had seen Marton apply in phenomenographic analysis.

Written exercises

Phenomenographic analyses are characteristically based on interview material. However, I took the view that interviews with students would not make visible what the students actually did when they were

studying, and how they interpreted the requirements of the tasks they were set. Instead, I designed a set of exercises which I asked the case-study students to complete at the beginning and end of the year in which I observed them.

I expected that the way students interpreted these exercises would reflect their apprehension of their teacher's expectations. This expectation was based, in part, on studies by Doyle (1986) and by Säljö and Wyndhamn (1987, 1988). These studies imply that many students expect the context of a school task to supply clues on how to tackle it. Doyle argues that teachers frame the tasks they set by reducing their cognitive demands, so that tasks are grouped, practised, and clearly signposted. He emphasises the significance of the design of tasks presented to students. His work suggests that teachers very often construct classroom tasks where the contextual guidance is so heavy that active thinking is not required or developed; and that students work within the bounds of the framework which the teacher establishes (Doyle 1986). In a similar vein, Säljö and Wyndhamn argue that teachers' practice actually sustains this reliance on contextual cues:

> Competence growth can. . . be seen as resulting from conscious efforts to make it possible for students to handle tasks in situations when the educational framing of tasks becomes less prominent. To become internalized as a genuine part of a person's intellectual repertoire, the skill must be dissociated from the immediate context in which it was acquired. The difficulties inherent in achieving this dissociation of cognitive operations are probably grossly underestimated in formal educational institutions where the pedagogy relies on practising standard examples and where the problems of 'generalizing' are largely left to the pupil to solve on his/her own accord (Säljö and Wyndhamn 1988, p. 70).

In effect, these students read the instructions as an intrinsic part of the task.

If students' readings of a task are framed by the expectations established by their teacher, then differences between classroom groups could be understood as evidence of the extent to which the teachers have enculturated their students into different readings of the discipline. I concluded that setting discipline-based exercises would enable me to look closely at what students actually did when they tackled a specific task, and to evaluate the effect of the teachers' conceptions of their subject on their students' work.

I therefore asked students in each of the classes to describe what they did and how they went about it, and to tackle some open-ended problems in their discipline.

At the beginning and end of the year, the students responded to a set of tags prompting them to describe what they aspired to in studying the subject, what they did when they were studying, and what they did in class; at the end of the year, I also asked them to describe what the subject had been about. This task elicited explicit statements about what the students were studying, and these formed the basis for my analysis of their conceptions of what was to be studied.

In addition, I asked the students to tackle open-ended problems in their discipline—open-ended, so that the issue was not whether they arrived at a correct answer, but what they discerned to be the appropriate way of tackling the problem, and what relationships they saw in the situation described in the problem. A similar approach was successfully used by Säljö and Wyndhamn in relation to mathematical ideas, in the studies I have cited above; by Marton, in relation to students' ideas about learning; and by Bowden and his colleagues, specifically in relation to students' ideas in physics.

In physics, I asked the students to respond in writing to a set of qualitative problems, described as 'physics problems'. The problems used were framed in a similar way to past extended-answer questions in the Year 12 VCE exam, for which all the students in the study were preparing. They were selected from a group of twenty problems used in the Conceptions in physics project referred to above. The questions are sufficiently open-ended to be accessible and challenging to students with a range of prior experience. Each problem calls for students to discuss an everyday situation in terms of principles and ideas which seemed likely to appear early in any senior school physics course. In the previous research they had been used in an interview format with both Year 12 and first year university physics students; for this research, I trialled them in pencil and paper format with students completing Year 12. In every case a range of understandings was elicited. The two pairs of problems chosen for the study each included one problem turning on Newton's Third Law, and one involving relative velocities. All the students had had experience in Year 11 of mechanics problems involving forces and velocities.

These problems were administered in a crossover design. At the beginning of the year half of each class did one pair of problems, and half the other; at the end of the year, they all did all four problems. I reasoned that this would enable me to control for any effect of famil-

iarity, and at the same time make it possible to see whether students changed their approach to a particular problem.

My purpose in getting students to tackle these problems was twofold. I wanted to find out how the students understood what was required: what they focused on about the problem, in attempting to provide an answer to it. In this aspect of the analysis, their answers could be understood as manifesting different conceptions of physics. Secondly, I was interested in the images of physics principles which their responses displayed. My procedure here followed the model offered by the Conceptions in Physics project, though my analysis was conducted independently of their findings.

In history, I devised two exercises, modelled on a diagnostic exercise developed by Peter McPhee for first year students at the beginning of their study of history at the University of Melbourne. The exercises required students to read a brief passage from an historical text, and then to answer a set of open-ended questions. Because the four classes in the case study had no common topic in Australian history, the extracts were deliberately set outside Australian history. One, an extract from Hinton's *Fanshen*, focused on the changes in women's role in Chinese society following the Communist Revolution, as exemplified by a conflict between a woman and her husband where the woman successfully insisted on her right to attend public meetings (Hinton 1972). The other was an extract from Garrioch's *Neighbourhood and Community in Paris, 1714–1790*, in which Garrioch discussed the function of public quarrels, illustrated by an animated reconstruction of a dispute between the wife of a public writer and a pawnbroker (Garrioch 1986).

I asked students to do these exercises primarily to discover what they attended to when they read an unfamiliar historical text. In both cases the questions I asked were designed to give students an opportunity to reflect on the argument propounded in the text; to identify the structure of this argument; to speculate on the outcome of the story and the purposes of the writer; and to locate the extract within a more general frame of reference. In analysing the responses, I again adopted a phenomenographic approach, looking to see what the students focused on in reading the text, the frame of reference they used, and their positioning of the author in relation to the events and arguments propounded in the text.

Analysing the material

PHENOMENOGRAPHIC ANALYSES

As indicated in Tables 2 and 3, I undertook a number of phenomenographic analyses of this material, investigating:

- teachers' conceptions of their discipline (conducted separately for physics and for Australian history);
- students' conceptions of the subject (conducted separately for physics and for Australian history);
- students' conceptions of the requirements of the particular task (conducted separately for each task);
- students' conceptions of the relation between force and motion (in two different contexts);
- students' conceptions of the relation between the historian and the historical account (in two different contexts).

The protocol I developed for these analyses followed a consistent pattern, iterating repeatedly through a sequence of six steps.[4]

1. Formulating the phenomenon of interest

   This was less obvious than it sounds, and I returned to it after each round of sorting the responses.

   I analysed the interview transcripts with the aim of identifying different ways in which these teachers represented knowledge within their subject, and students' learning in relation to it. In these analyses, I particularly considered what different teachers focused on in talking about the study of a particular topic, and the language they used to describe it, especially the dominant metaphors. I found there was an intelligible association between the teacher's characterisation of the subject, and the metaphors which expressed students' relation to it. I was therefore able to integrate insights from the work on metaphor and teacher thinking described above, and the phenomenographic approach developed by Marton.

   Defining the relevant phenomenon was particularly critical in relation to the history passages and the Newton's Third Law problems, where I was seeking to identify a phenomenon which would be intelligibly related to the variation in students' responses. I tested and rejected a number of possibilities.

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[4] I modelled this approach on the work of Bowden *et al.* in the University of Melbourne Physics project group, mentioned above. The account given here, however, is my own.

2. Deciding on the unit of analysis
   Frequently phenomenographic analyses are based on segments of interviews rather than complete interviews. I considered this approach, but decided to treat each response as a gestalt. In the case of the interviews, I took the whole of each interview; in the case of students' responses to my sentence completion prompts, I took the responses as a cluster; in the case of responses to the history passages, I dealt with each passage separately, but considered the responses to it as a cluster; in the case of responses to the physics problems, I took the response to a particular problem separately from the student's responses to other problems.
3. Sorting responses in terms of the focus and frame of reference they evinced in relation to this phenomenon
   This derived from suggestions made by Ference Marton in meetings of the University of Melbourne physics project group. I found that identifying the focus of each response was a powerful strategy for grouping responses, and identifying the frame of reference helped in describing the grouping. Again the sorting was an iterative process.
4. Developing a description of these groupings
   That is to say, trying to find a way of describing the grouping which identified what the responses had in common: their focus and frame of reference.
5. Assessing the fit between individual responses and my description of the grouping
   Where responses did not fit, I either sought to reclassify them into another grouping, or reconsidered my description of the grouping as a whole.
6. Considering the relation between groupings
   At this point, I looked at the category descriptions to see whether, and how, they might be structurally related to each other, and if so whether a hierarchy of categories had emerged. Generally it seemed possible to order the categories from the less complex and the less complete to the more complex and more complete; in relation to teachers' conceptions of physics and history, however, it seemed prejudicial to assume that the ordering was hierarchical in advance of exploring students' experiences. My eventual assessment drew on a range of material to argue that there was a hierarchy in these conceptions; it was not based exclusively on the category descriptions.

I did not recruit others to re-categorise the material; the task was large, and I concluded that Sandberg's arguments to the contrary were persuasive (Sandberg 1997). However, the steps I followed broadly conform with Sandberg's (1997, p. 210) interpretative guidelines:

- an orientation towards the phenomenon and how it appears throughout the research process;
- seeking to describe the experience under investigation, rather than trying to explain it;
- horizontalizing the material being analysed—treating everything which is said as being of equal importance;
- seeking structural features in the experience under investigation;
- using intentionality as a correlational rule (looking at what is focused on and how it is represented).

I followed his guidance also in presenting my final analyses in some detail and with extended examples, so that they can be assessed in terms of their persuasiveness and the insights they offer.

DISCOURSE ANALYSIS

Whereas phenomenography seeks to simplify discourse by discerning commonalities and similarities in the way in which representations of phenomena are patterned, discourse analysis attends to the detail of verbal interactions in which the attention of the participants is focused, modified and shaped. In developing my own approach to discourse analysis, I drew particularly on Lakoff's work on the way in which embedded bodily metaphors express fundamental relationships (Lakoff 1987); Schön's analysis of the movement of argument and question in coaching sessions by 'master practitioners' (Schön 1983); and Walkerdine's analysis of interactions in which the teacher's language, questions and encouragement work together to produce the rational child (Walkerdine 1988). In analysing how each teacher constructed the discourse of his/her classroom, my principal steps were:

1. Identifying the teacher's 'framing metaphor', drawn from the verbs s/he used in describing his/her practice
   I revisited these verbs from time to time as I developed my account of each teacher's practice.
2. Observing a considerable number of lessons
   Because I was conscious that brief episodes of observation might be seriously unrepresentative, I observed and recorded around twenty-five lessons taught by each teacher. These lessons included at least one series on the same topic, and a range of lessons with different activities. For physics, this generally included experiments, option work, whole-class instruction, and work on problems; for history, it

included group-work, student presentations, whole-class instruction, option work, and feedback on assessment tasks.

3. Reviewing my records of these classroom observations
   In these reviews, I listed the tasks which the teacher set, highlighted the questions s/he asked, highlighted questions and contributions from students, and characterised the teacher's responses. I particularly sought to find moments when teacher and student were at odds, so as to discern the boundaries which the teacher was drawing and the grounds of the student's contestation.
4. Characterising the teacher's focus across lessons
   This was a quasi-phenomenographic element in the analysis. Working through my records, I sought to describe the focus of attention in each lesson—what was given attention, what was excluded or ignored—and compared it with the teacher's focus in other lessons.
5. Selecting comparable episodes for detailed analysis
   The episodes which I analysed in detail were chosen primarily because they related to the same element of the curriculum. In the case of physics, I made a point of attending the first lesson each teacher taught on Simple Harmonic Motion: it incorporated fundamental mechanics principles (hence provided a link to the problems I was using as an exercise); and unlike other mechanics topics, all the classes were encountering it for the first time in Year 12. In history, the choice was less straightforward, as there was no common topic, only common concepts; I decided to select lessons where the teacher addressed the concept of empathy, which again was thematically connected with the exercise I had given.
6. Articulating the movement of discourse within the selected episodes
   I sought to connect each of these analyses with the teacher's framing metaphor and conception of the discipline, and to check my interpretations by visiting and revisiting of other transcripts. I also drew on students' comments in interviews and in response to my questionnaire prompts.
7. Sharing my interpretations with the case-study teachers
   I sent all the teachers copies of early draft accounts, which I discussed with them informally; this was the point at which I asked them to nominate pseudonyms. When the work was nearly finished, I sent them copies of the relevant chapters in close to final form, and contacted them for feedback.

Apart from feedback from the teachers themselves, I did not seek outside confirmation of the interpretations I offered. As with the

phenomenographic analyses, my accounts of classroom discourse are primarily offered as interpretations which must be judged on the insights they generate.

Learning from the process

I want finally to mention briefly some issues which emerged for me from this work.

First, I was struck by the difficulty of using my phenomenographic analyses to develop an account of change over time. Analyses of conceptions are not intrinsically dynamic, and in fact I have heard them described as if the categories of conception reflect the historical development of thinking in a particular area (the Aristotelian conception of the relation between force and motion, for instance). It was hard to depict and characterise change in the conceptions evinced by particular individuals. I tried converting my coded responses into responses on a Rasch item-responses scale, but this seemed crude and non-intuitive. I am currently interested in the implications of Marton's more recent work on the experience of variation, which I think might help me recast my account of the students' experience and make it easier to give an account of interactions between students and teachers and the changes which result.

My second point relates to the importance of remaining open to the implications of the data. This is often described as 'bracketing out' one's expectations. In fact, I would rather describe it as becoming conscious of one's expectations, and actively challenging them! It will be evident from the summary I have given that I expected that the teachers would have an impact on their students' approaches to the tasks I set. When I came to look at the students' responses to the four physics exercises in Term 4, I was puzzled and rather disappointed to find that their approaches were not consistent: students who took an essential mathematical approach to two of the tasks took a much more qualitative approach to the other two tasks. It was some time before I realised that I was not seeing what was in front of me. In fact the students were responding quite consistently to the wording of the tasks I had set.

These two points raise a third which I think is important to anyone trying, as I was, to combine a case-study approach with a phenomenographic analysis. Phenomenographic categories are described by Marton as the result of a 'second order analysis'. They characterise ways of representing a phenomenon, rather than individuals. In reviewing my classroom observations, I found that in each class, there

were some discrepant moments when students' relation to the subject was constructed in a way I found surprising. Moments like these demonstrate that the teachers' practice was dynamic. While the conceptions I discerned in the interviews were broadly visible in their practice, they were all actively engaged with their students and with what they were teaching; they were open to change in a way which is not visible in a static analysis of conceptions.

Finally, the separation between the researcher and the participants which I adopted from the outset arose, I think, from an objectivist paradigm which I now find somewhat uncomfortable. The distance I established was partly because I was wary of intruding on or influencing them, and partly also because discussing my interpretations seemed likely to press them to justify or theorise what they did. I tried to keep very close to what actually happened, to provide substantial detail of particular lessons and students' responses. At the same time, however, the interpretations I have offered are abstract—again, a second-order analysis—in that I have tried to draw out of this material the implicit conceptions of what is to be studied and how. As researcher, I developed my final analyses independently, rather than working on them with the teachers. While I did share my early papers with the teachers, there was a long period in which I was working on the material in which I did not consult with them. Another time, I would aim to adopt a more collaborative approach and to develop a shared understanding throughout the research process.

Overall, the methodology I have adopted has been qualitative and interpretative, focusing on making sense of what teachers and students said and wrote. I have tried to be careful, thoughtful and open in my interpretations. Given the project I have addressed, it is less important that my findings are seen as valid and reliable, than that they are generative of new insights into the relation between teaching and learning. This is a judgement which only others can make.

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CHAPTER 9

Using phenomenography to study organisational change

Ruth Dunkin

Introduction

My doctoral study sought to enhance understanding of organisational change by presenting change agents' perspectives on organisational change. I had found a large and varied literature on organisational change but despite change being experienced differently—depending on the role played—many existing models of change derive from investigation and observation by external researchers. The perspective of those charged with making change in organisations was not systematically presented. The models of change which change agents adopted were not articulated; the sense they had made of their experiences was absent. I believed that by filling this gap more would be understood about organisational change, how the current literature assists and where it fails to guide.

My research purpose required a method that would allow the perspectives of change agents to be described and classified. I was interested in how change agents conceptualise their role as change agents, how they choose strategies for making change, whether they think they are successful. I sought to be systematic in my presentation of change agents' perspectives to allow the range of perspectives to be described and in a form that facilitated a comparison with existing models of change in the literature. At the same time, I was keen to preserve their voices as much as possible. This chapter outlines the considerations in choosing an appropriate method.

In confronting the methodological literature, the difficulties of choosing a research method became evident. It was not just a case of sifting through the many methods potentially available to ensure that I found one that would facilitate my research purpose. Rather, it became a question of balancing those considerations with the potential legitimacy and acceptability that the findings might be afforded. While I personally found persuasive arguments that research methods should be chosen for their fitness-for-purpose and I could accept that

different cultures of inquiry make different knowledge claims, I also found that these knowledge claims are not universally embraced (for example, Pugh 1983). Despite strong advocates such as Morgan (1983) for multiple research perspectives to be brought to bear on social phenomena, such arguments are rejected in many disciplines and by individual researchers within the research community. These researchers insist that knowledge can only be advanced through particular methods, that theories can only be constructed in particular ways and that findings must be generalisable (Burrell & Morgan 1979). The desire for respectability, coupled with concerns to prescribe ways of improving the effectiveness of organisations and managers, has led the relatively new area of management research to be dominated by positivist research methods (Bennett 1991).

Underpinning the debate about method are differing assumptions about the nature of reality and how it may be known. Those who adopt the positivist, or scientific, tradition believe that the social world exists as an objective reality that can be discovered by the application of scientific methods and that it tends toward equilibrium and order. In contrast, those who adhere to anti-positivist or interpretative traditions believe it exists in the minds of individuals and is not one stable reality but many, often conflicting, realities. This is not just because they approach reality in different ways, but also because of the complexity they confront. People deal with only part of reality at any one time (Theobold 1998).

Organisational change, like all social phenomena, is perceived differently by those who initiate change, those who sponsor it, those who are the recipients of it and those who observe, or research it (Kanter et al. 1992). For each the experience is different, with varying views about what occurred and why, whether it was a 'success' or a 'failure', whether it was 'good' or 'bad' (Starbuck & Milliken 1988), whether it was a 'small' or a 'large' change. I believed understanding of organisational change would be enhanced by an appreciation of these diverse perspectives. But in pursuing this research aim I was conscious of the lack of acceptance that my findings might have within the management research field. I needed a research approach that balanced these considerations as much as possible.

Range of potential methodologies available

I began by seeking to understand the range of methods available. I quickly concluded that while the dominant research method for the field lay within the scientific culture of inquiry, my research purpose

would be better served by a qualitative approach. This derived from my belief that there was not one reality that was organisational change but many, and that I sought to understand one view of that reality in a depth that would not be facilitated by a quantitative survey approach. The starting point for the study was not a hypothesis to be tested but rather an attempt to build understanding of organisational change.

The review of cultures of inquiry by the Fielding Institute (1992) shows a continuum of descriptive methods. They range from pure description (phenomenology) through description and interpretation (hermeneutic research) to description, interpretation, explanation and action (action research). All are concerned with ensuring that the original voices of the social actors are preserved, but as the method incorporates greater explanatory content, the voice of the researcher is added to that of the original actors.

Differences arise between the methodologies in relation to the object of their inquiry, the purposes to which the research will be put, the aim of the research, the nature of the data and the role of the researcher (see Table 4).

Of the four methods depicted in Table 4, two methods were potential research approaches. These were phenomenology and phenomenography. Both are used to study and describe people's experience of phenomena. I rejected the hermeneutic and ethnographic approaches because my primary interest was neither contextual understanding nor the culture of change agents as a group.

I thought phenomenography a better match for this research purpose for two main reasons. First, it enabled the *range* of perspectives of organisational change to be presented. Where phenomenology presents a collection of separate individuals' perspectives, phenomenography presents the range of perspectives in a collectivised system of categories of description that aim to capture the essence of the different ways of experiencing the phenomenon. This is because the research task in phenomenography lies not just in describing phenomena as others experience them, but also, and more importantly, in describing the variation between these ways of experiencing. The similarities and the differences between the ways people experience or see a phenomenon are the critical points of interest. The units of analysis are 'ways of experiencing', or the different ways in which people structure or organise their awareness of both situation and phenomenon at any particular time (Marton & Booth 1997).

Perhaps this difference between the two approaches is more starkly underscored by considering the typical sample sizes of each

type of study and the organising questions that each uses. In phenomenology, because the interest is in thick and accurate description, the study population is typically small. Each individual's experience is articulated from a variety of angles. A phenomenological study might be the articulation of just one person's experience. It asks 'How does the person experience their world?' or often, 'How did I experience this phenomenon?' In contrast, because of phenomenography's focus on identifying and mapping the different ways which people experience a phenomenon, the study population is typically larger—between fifteen and twenty useable cases (Bowden 1996). Phenomenography asks 'What are the critical aspects of ways of experiencing the world?'.

Table 4 Assessment of potential methodologies[1]

Focus of interest	Understand individual human experience/ meaning	Understand context	Understand cultures of groups	Understand variations in ways people experience certain phenomena
Use when	No established understanding or distrust of prevailing understandings of phenomenon	Understanding of context to a phenomenon will shape interpretation of it	Explanation of group behaviours and patterns of thinking	Need to map different ways in which people conceptualise and understand aspects of world
Purpose	Describe	Describe and interpret	Describe, interpret and explain	Describe, categorise
Raw data	Raw data	Historical records, stories	Stories, observations	Stories
Role of researcher	Recorder, instrument of articulation	Use foreknowledge and prejudices of researcher to interpret	Recorder and interpreter	Recorder and classifier Classification implies some interpretation by researcher
Discipline Base	Philosophy	History	Anthropology	Empiricism

Source: Adapted from Fielding Institute (1992) and Marton & Booth (1997).

[1] Some methods have not been included in the comparison presented in Table 4 because their objects of inquiry or purpose did not match the needs of this research.

The second reason for preferring phenomenography lay in the way organisational context is treated. The organisational change literature often suggests that organisational context influences choice of change strategy. Thus I considered a research approach that acknowledged organisational context particularly apt. This acknowledgment arises from two assumptions made by phenomenographers. First, they assume that people's 'ways of experiencing' phenomena result from the unique interaction of their understanding of the phenomenon and the situation in which they must apply that understanding (Bowden & Marton 1998). People experience a phenomenon in actual situations, combining in that experience understanding, acting and their perception of the situation. Change agents in this study were asked to disclose their experience of organisational change by recounting what they thought they had done in two specific instances, or situations, of change. This meant that what I captured was not their understanding of organisational change in the abstract, but embedded within real instances of change.

Another key assumption of phenomenographers is that people experience the world differently. Their ways of experiencing differ because individuals vary in their comprehension and perception of phenomena and situations. Each will discern, at any one time, different elements of the phenomenon and the situation. Some will be aware of some relationships between the elements of the situation; others will be aware of, or discern, other relationships. For some, particular features will be to the fore; for others, other features will be. How people layer their awareness and understanding of phenomena and situations affects their 'way of experiencing' those phenomena. For example, in this research those who were described as 'out-front leaders' tended to see the facts and figures of the organisation, whereas those classified as 'political leaders' tended to see and focus on the political interests and groupings of the organisation. The different focus of observation led them to design their change strategies differently.

Faced, then, by a choice between thickness of description of the experience of *some* change agents (phenomenology) and mapping the range of perspectives of *all* change agents (phenomenography), I chose the latter because such a systematic presentation was missing from the literature. Yet I found that phenomenography was capable of being supplemented by other approaches that partly offset some of its disadvantages. For example, the potential loss of individual change agent voices resulting from the development of collectivised categories of description was balanced by presentation of case studies featuring individual change agents. By selecting an empirically-based

and representative qualitative research approach, I adopted an approach that was more closely aligned with research traditions in the management research field. However, those traditions also had greater expectations of more interpretative findings than normally provided through phenomenographic studies. Again, these expectations could be met by adoption of supplementary approaches.

I considered two alternative approaches to phenomenography as a means of mapping change agents' perspectives on change. The first was Kelly's (1991) repertory grid approach that represents an individual's personal constructs on a particular topic. The second was Bourgon's (1983) Self-Q mapping technique. One practical consideration related to the amount of time that the selected change agents were prepared to make available. Both alternatives require a series of iterations and time commitment from the interviewees that would have significantly reduced preparedness to participate. But more fundamentally, these approaches did not seem to be as flexible or to provide the fullness of description offered by phenomenography. Both stress conceptual understandings. Phenomenography allows, instead, a combination of conceptual understanding, acting, experience and situation, by firmly locating the conceptions of organisational change and change-making within concrete instances of change. While the focus of interest in this research project was the change agent, it was the relationship between the change agent and the organisation, as perceived and constituted by the change agent, that was specifically of interest.

Another potential method was grounded theory (Glaser & Strauss 1967). While this approach uses similar data collection methods as phenomenography, it differs in two important aspects. First, excerpts only from the transcripts are analysed, rather than whole transcripts. Second, while it shares a focus with phenomenography on distilling the underlying conceptions of what is being said, like the repertory grid method, grounded theory is often approached from that perspective which seeks the unconscious intent of the interviewee (Cherry 1998), rather than the integrated situational and personal (relational) focus that is the hallmark of phenomenography (Marton & Booth 1997).

In summary, phenomenography offered a qualitative research approach that is empirical, representative and yet, at the same time, descriptive. It allows people's perceptions and understanding of organisational phenomena to be described and categorised without requiring the researcher to have psychological training. It has provided an avenue for presenting and using people's direct experience of

an element of organisational life. It represented the best-fit solution between the competing considerations that I faced in selecting an appropriate research method.

Data Collection

Means of collection

Semi-structured interviews are the standard data collection method for phenomenography. The interviews lasted about an hour and were held in the change agent's preferred location. They were taped and transcribed. The stories of the change agents were captured as they wished to tell them, although the existence of some structure ensured consistency between interviewees. Interviewees were told that the project sought change agents' perspectives on organisational change. Each was asked to recount two instances of change in which they played a significant leadership role. They were asked to describe one case they deemed successful and another they judged was a failure.

For each case of change, they were asked to describe the change situation: what the change was about, the major players, the organisational circumstances, the sponsors of the change, the opponents or hindrances to the change, how they went about initiating and driving the change, who they involved, how, why and when. Questioning around these points was unstructured, coming as a series of prompts as the change agents told their stories. These prompts sought either elaboration or to maintain the focus of the interview (Walsh 1994). Care was taken to avoid leading questions (Francis 1996), and I declined any invitations to discuss or comment upon issues until after the interview was over.

The sample

The sample comprised twenty change agents, who volunteered thirty-five cases of change. 'Change agents' were defined as people who have been charged with creating large-scale, management-controlled change within organisations, either on their own initiative (as part of their job) or at the request of others, usually a chief executive officer, Minister or Board. Thus the sample either see themselves as change agents and/or are recognised by their peers inside and outside their organisations as change agents.

In establishing the sample size, note was taken of the experience of phenomenographers that twenty to twenty-five potential interviews

were preferred, allowing for some of those to be discarded because of breaches of interview protocol or other failures. Their experience (for example, Trigwell 1994, Morse 1994) is that for saturation of categories to be reached, some fifteen to twenty interviews are required. In this case while only twenty interviews were conducted, all were verified as useable (Bowden 1998).

The selection of 'subjects' was based on purposive sampling (Glaser & Strauss 1967, Bowden 1994, Morse 1994); that is, consistent with the definition given above, these were people known for their involvement in change-making. Preference was given to those who were senior organisationally and thus could be expected to be experienced and to have had the opportunity to reflect on their change-making. No judgment was made about their relative success as a change agent because the research purpose was to present the range of change agents' models being used.

The sample was also structured to provide representation of four organisational types and to provide for gender balance. Both factors had been identified as possible influences on change strategy (Dunphy & Stace 1992, Karpin Report 1995). The sample was also restricted to people of Anglo-Celtic background to facilitate comparisons with the literature's models.

Data Analysis

Two primary phenomenographic studies were undertaken. The first investigated the different ways in which change agents define their role within the change process. The second study categorises and describes the different kinds of strategies adopted by the change agents to implement organisational change. A derivative study mapped the relationship between the two sets of categories emerging from the first two studies, to form three broad approaches to change.

Classification system—categories of description

Analysis of the transcripts was undertaken for the two primary phenomenographic studies on the same basis. In both cases, the process of analysis involved two people—a phenomenographer/challenger and me, as researcher. The pattern of involvement by each differed between the two studies and this variation is discussed shortly. But first, I give an account of the transcript review and analysis.

The transcripts were read in total several times to obtain an overview of the available data. During this process, the phenomeno-

grapher/challenger confirmed that all the transcripts met phenomenographic protocols. For each study the focus of the reading varied. In the first study, the transcripts were read from the perspective of identifying the different ways in which the change agents had conceived their personal role and responsibilities within the change process. In the second study, the transcripts were read from the perspective of identifying the different sorts of strategies and techniques used to pursue the change objectives.

After gaining an overview in each case, an initial set of categories of description was developed to describe the different ways in which change agents conceived either the role or the different types of strategies used. In constructing these categories, the key similarities and differences of approach were noted and grouped. The latter were gradually refined to become the dimensions of difference around which the ultimate categories were organised. Although the process of analysis was the same for each study, the analysis was undertaken separately for each study and it considered the data from a different perspective each time.

Having developed the initial categories of description, the transcripts were revisited to assess the extent to which they encompassed all the data. A succession of refinements of categories ensued. In the first study on role, it became apparent that the conception of role varied with the change activity undertaken. In this study, the categories were refined by the researcher and phenomenographer eight times. In contrast, the second study on kinds of strategies was more straightforward and required only one set of categories of description. Seven iterations occurred before a set of categories of description was settled upon by the researcher and phenomenographer/challenger as satisfactorily describing the different kinds of strategies in use.

Categorisation process

Each case of change recounted by the change agents was analysed as a whole. Phenomenographers differ on whether transcripts should be considered as a whole (Trigwell 1994) or can be dealt with as fragments (Marton & Booth 1997). In this project I generally adopted the more cautious approach of dealing with the whole case because of the subsequent need to compare the findings with approaches already described in the literature. A more fragmentary approach to the transcripts might have resulted in sufficiently abstracted categories of description that, combined with a relatively unfamiliar research approach within the field, might render the findings implausible. The

'realism' of the categories is an important test of the research's rigour (Säljö 1996). The major division of the transcripts occurred in treating separately the two cases of change recounted by change agents. This was justified by the change of strategy sometimes evident between the two cases.

As foreshadowed above, the pattern of engagement between the researcher and the phenomenographer/challenger in developing the categories of description differed between the two studies. Although I did not set out to test the two different approaches reflected in the phenomenographic literature, the absence of the phenomenographer/challenger during the analysis in the second study necessitated a different approach. In reflecting upon my experience of each, I asked myself two questions: first, how can the researcher feel comfortable that the analysis has been taken as far as it can be? And second, how does it feel to undertake the analysis on one's own?

In the first study, the phenomenographer/challenger and I developed the categories of description together. We began by each separately developing a draft set of categories by maximising the similarities and differences between the transcripts. Two sets of categories allowed our conversation to begin. Although I bore the responsibility for the ongoing development and refinement of the categories, the process of developing his own initial set of categories helped the phenomenographer/challenger to review and challenge the categories of description I put forward.

This process continued until we both felt satisfied that, based purely on what appeared in the transcripts, my final categories of description adequately captured the different conceptions of role articulated across the change agents' cases.

In the second study, I refined the categories of description alone, until the last iteration was reached. At that point I engaged in a process of justification and defence to the phenomenographer/challenger. He had re-read the transcripts from the perspective of the second study focus, that of the strategies used.

In both studies, the iterative, or refinement, process occurred weekly. This interlude assisted in refining the categories; it was essential in the second study which I undertook alone. Without that weekly break, it would have been difficult to return to the transcripts and examine them with new eyes to a satisfactory level of rigour. The break enabled me to reduce my ownership of the previous iteration of categories and they became, in themselves, an object of study. To use a photographic image—the categories, at the time they were established, filled the viewfinder. They were like objects on 'zoom'. They

obliterated the background so that I could only see the categories as written. A week later they had been reduced in image to 'normal', so that I could discern other elements within the transcripts.

In the literature, the debate on the pattern of engagement between the primary researcher and their challenger(s) (Bowden 1994, Walsh 1994) relates to whether individual researchers, working on their own, can be too heavily influenced by their earlier analyses in the development of the categories. The point of contention is whether individual researchers terminate analysis before refinement of the categories is exhausted.

However, in my experience, there is a second aspect to this issue. Although there are strong warnings to intending phenomenographers to bracket, or hold aside, prior experience and knowledge of what already exists in the literature (Marton & Booth 1997), the question is whether this is possible. The final iteration, involving counter-challenge and justification of the categories by the researcher to the phenomenographer/challenger, provides some protection should bracketing fail. However, I certainly found the higher levels of self-discipline required in the second study harder to sustain. For example, in the first study whenever I reverted to my prior knowledge of the interviewee to justify a category, that slip was immediately challenged and I was asked to justify the category with evidence from the transcript. In contrast, in the second study such a reversion potentially remained undetected until the final iteration.

The additional advantage of the immediate challenge also came with the lack of detailed understanding of the change management field by the experienced phenomenographer. As the researcher immersed in the literature, I slipped into the well-worn categories of approaches and leadership styles that characterise that literature. The immediate demand by someone, less familiar with the literature's categories, to know the source of the data for category assertions, was helpful. This immediacy became, then, an added force for rigour.

Thus, there were two difficulties associated with undertaking the 'lone researcher' approach and employing a delayed challenge process. The first lay in the lack of an immediate challenge to prior perceptions or knowledge of the person which was not captured in the transcripts or to the use of pre-existing categories in the literature. Second, I had difficulty in this bracketing precisely because much of this 'foreknowledge' is embedded thinking and I am unaware of its influence.

The process in which the challenge to categories was immediate felt more efficient. Disengaging from a commitment to a particular

description was easier and quicker. Had an inappropriate use of foreknowledge survived until the eighth iteration, this would have increased the time required for analysis and led to some frustration. My experience of both patterns of engagement then leads me to comment that it is easier on both researcher and challenger if the process of analysis and iterative refinement of categories of description is ongoing. It is further assisted if the challenger is unfamiliar with the interviewees and with the substantive field of research.

I have described a process that included only two people. In previous research studies using a multiple-person approach, there have been much larger teams (for example, Bowden 1994). The use of a larger and more diverse group is likely to ensure that analysis is taken as far as it can be taken, but this advantage can be offset if group effectiveness is reduced. An effective challenge process requires trust and confidence within the group. While these are also the very elements that can lead to 'group-think' (Allison 1971), they are also essential to ensure that the group does its work.

Bowden's (1996) physics project, for example, did benefit from a larger group through which the challenge and counter-challenge process could occur. However, that group split into two smaller subgroups because of the difficulty of managing the logistics of a larger group. Those who regularly attended and contributed to the group established a trust and confidence in the process and in other group members which was not the case for those who attended irregularly (Bowden 1998). The sense of progress in category refinement came from that consistent participation. The larger the group, the less likely it is that consistent participation is achievable. This suggests that there may well be a size of challenge group in which there is an optimum balance between the effectiveness of group dynamics and the challenge process.

Because of my concerns about whether using only two people for the challenge process was sufficient to establish the confidence of the reader in the categories, a separate process of defence and justification of the categories was adopted. This process resembles the interjudge reliability test (Sandberg 1996). A third person, this one unfamiliar with phenomenography, but skilled in grounded theory and familiar with the change literature, reviewed the final categories of description separately and in isolation. The transcripts represented her only reference point thus requiring the categories of description to stand on their merits. She confirmed the categories of description.

A Final Comment

My doctoral study not only involved seeking to enhance understanding of organisational change. It also involved trialling the application of phenomenography to management research. Phenomenography was selected as an approach to map change agents' perspectives, while at the same time meeting common expectations from within the management research field for empirical and generalisable results.

The approach proved adequate to the research task and resulted in research findings that met the research aim of enhancing understanding of organisational change. By supplementing the primary research approach of phenomenography with the concepts of sensemaking and personal style, I was able to suggest hypotheses about how change agents develop their understanding of organisational change and establish their models of change. These supplementary conceptual approaches offered insights into some of the puzzles from the literature, such as why people find it difficult to swap between paradigms and why they are attracted to the latest fad. If the models and theories of change that dominate the organisational change literature generally represent the sense scholars or individual practitioners have made of what they have observed in organisations, this research, in contrast, was able to explore the range of models of change of change agents. This work therefore supplements research on change in organisations undertaken from within other research traditions and from the perspective of other players or observers of the change process.

I found that phenomenography offers a qualitative research approach that is empirical and representative and yet, at the same time, descriptive. It allows people's perceptions and understanding of organisational phenomena to be described and categorised providing an avenue for presenting people's direct experience. This study has also shown that adoption of a phenomenographic approach does not preclude the use of supplementary approaches, either for analysis or interpretation, making it relatively flexible. Further, by adopting this approach, embedded as it is in educational research, concepts of adult learning could be applied to management or organisational research in ways that were unlikely had a more traditional management research approach been used.

However, applying a phenomenographic approach outside the educational research field was not without its difficulties. These revolved primarily around the general lack of familiarity with the approach—its language and concepts—from those outside its original field of inquiry. Seeking to untangle the assumptions of the approach

from the substance of the research field in which it originated—educational research—was often difficult. The vocabulary and concepts used to describe the approach derive from phenomenography. They differ from the language and vocabulary of management or organisational researchers. I also found that there was some ambiguity and a lack of clarity in how to operationalise phenomenography. There is therefore a need for experienced phenomenographers to continue to refine issues of method (Dall'Alba 1996). It may be axiomatic to suggest that help in this exercise might be given from those outside the field, to whom many of the concepts appear strange. Asking the apparently simplistic question can be a powerful means of elucidating hidden assumptions and beliefs.

But, on balance, I believe that phenomenography as a research approach potentially has wider application than educational research. This is because it respects the uniqueness of individual experience and subjectivities, as well as the diversity of influences shaping that experience, while at the same time providing a sensitive way of comparing and categorising across individual experiences. Phenomenography is thus a research approach suited to any setting where there is both an exploratory or descriptive and more prescriptive intent.

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