NUDIST: A QUALITATIVE RESEARCH TOOL OR A MIRROR OF OUR OWN PEDAGOGICAL THEORIES?

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Qualitative research produces a wealth of complex, interactive ideas which are difficult for a an educational inquirer to control. NUDIST, a qualitative data analysis tool, speeds both categorisation of data and statistical analysis of data, while maintaining an ability to re-visit the original material. This paper illustrates the use of NUDIST to synthesise ideas resulting from one open-response item from a questionnaire. The major issue raised is the subjective nature of decision-making about categories used to form a conceptual framework for data analysis using NUDIST.

RESEARCH PARADIGMS

Popkewitz (1984) claims that the notion of having different paradigms of educational research helps us to define our fields of work and ways of working as researchers. He states that:

> ... the concept of paradigm provides a way to consider a divergence in vision, custom and tradition. It enables us to consider science as having different sets of assumptions, commitments, procedures and theories of social affairs. (p. 35)

The paradigm in use for any educational research project impacts on relationships between researcher and subjects, on modes of data collection and methods of analysis, and on ways that findings can be summarised and integrated. It also affects the replicability of the study, an ability to apply findings in other settings, and ways that the study is likely to be reported. Even though research paradigms are general philosophical outlooks rather than systematically formulated doctrines (Candy, 1989), there are agreed sets of assumptions and common sets of procedures which form a basis for developments within each of the major paradigms. Educational inquirers who display an empirical-analytic stance, for instance, take a different role in the research process (in methodological, practical and political terms), conceive different research questions for different purposes, and use different data gathering and reporting methods from their colleagues working in the interpretive-humanistic paradigm.

Empirical research.

The use of scientific research methods in the study of pedagogy is based on their wide use and (generally unquestioned) acceptance in the study of causal relationships within the natural sciences. In the study of human sciences, there is some support for the ability of this paradigm to produce sets of findings about current behaviours and their causes, and hence to make some predictions about future behaviours.

With its emphasis on quantifiable observations which lend themselves to the application of mathematical tools for analysis, research methods within this paradigm are aimed at the collection of relatively "objective" data by researchers who are external to the human interaction. Scientific control of variables and rigour in data collection methods result in possibilities for replicating findings. The potential for generalising findings to the wider community is also considered important. The reliability of tests and of observation instruments thus become vital factors in this style of research as they are employed in order to describe, "measure" and compare social behaviours, attitudes and beliefs, or aspects of classroom interaction.

Unfortunately, statistical generalisations and notions of causality are not easy to apply to the complex, changing and multi-dimensional realities of human interaction within social institutions. Other research paradigms have therefore been developed for use in the humanities.

Qualitative research.

Hermeneutical educational inquiry is based on the gathering and interpretation of qualitative data. Such research aims to understand rather than to explain. The aim is to capture the individual rather than to generalise or predict.

The complexities and uniqueness of an event or the interactive beliefs of members of a sub-set of society at a particular time are recognised as "objects" worth studying, rather than replicable phenomena.

Because of its habit of producing holistic data which is specific to particular research sites, and as a result of its challenge to established research criteria such as "validity" and "reliability", qualitative research has been criticized for generally lacking rigour, objectivity and control of variables (see, for instance, Kerlinger, 1973). Forms of research which make up this paradigm are overtly affected by values, power relationships and subjective interpretations of both researchers and subjects: the role of human agency becomes more recognisable.

It is not the intention of this paper to outline the strengths and weaknesses of different research paradigms, or to detail their complementary natures, for these have been discussed widely elsewhere (see, for instance, Kerlinger, 1973; Lincoln & Guba, 1985; Smith & Heshusius, 1986). As Sowden and Keeves (1988) note, "hardline distinctions that are commonly made between quantitative and qualitative research methods are largely artificial" (p.514). The debate about which paradigm is more suitable for social research has set up an artificial dichotomy which has unfortunately delayed consideration of what each paradigm has to lend to the other and of where important "touchstones" can be developed further.

NUDIST: Creating a touchstone

Qualitative research produces a wealth of interactive, and perhaps iterative, ideas in the form of interview transcripts, field notes, responses to open-ended questionnaire items, statements in documents, and so on. These are complex and varied enough to be difficult for a researcher to control - to categorise, to compare verbally or statistically, to chart or graph, and to decide what to report or omit.

Another likely problem is that in reporting such data, raw material is lost as it is replaced with generalities, such as "30% of the respondents noted that ... " or "one group of children discussed _". Such reductionism fails to capture personal use of terms and ideas accurately, and doesn't make available to readers rich details or examples. Thus reduction to general categories involves loss of depth of meaning as well as the coalescence of discrete ideas. Sowden and Keeves (1988) raise this issue when they claim:

> ... while an increasing amount of empirical research using qualitative data is being carried out, _ it is being reported in such a way that the conclusions cannot be verified_ This gives rise to the anomolous situation that while in research the evidence is rich and detailed, the very richness and detail of the data collected prevent presentation in a coherent form that would lead to acceptance of the findings as a contribution to scholarly inquiry. (p. 525)

Readers must rely on accurate classification of raw data by authors and have no way of checking interpretations made or the appropriateness of orienting constructs. Replication of the processes by other researchers or looking anew at material gathered generally involves repetition of lengthy analysis and synthesis processes.

The computer software program NUDIST, a tool for organising and managing qualitative data, helps researchers develop a productive relationship between qualitative and quantitative research paradigms by enabling them to overcome some of these tendencies. It provides techniques for handling textual data which speed both categorisation and statistical analysis while maintaining the ability of the researcher or other interested persons to re-visit the original data.

Basically, NUDIST allows the management and organisation of data through indexing. Primary textual data is coded, to be retrieved according to emerging categorisations. Categories for indexing are certainly not pre-determined because, as one manual (Richards & Richards, 1990) notes:

> ... what the user does with the retrievals, using such software, is essentially offline: all the theory-building, the shaping of understanding and the reshaping of the data in accordance with the changing understanding, is done outside the computer. (p.6)

In addition to indexing, or using NUDIST as a tool for content analysis, it can be used for the building of theory. While the former use draws the researcher closer to the empirical paradigm, the latter emphasises the emerging nature of understandings and thus seems to move the research process into the heumeutic paradigm.

NUDIST makes it easier for qualitative data to be expressed in quantitative terms and then worked with statistically but this does not add validity or objectivity to qualitative research: the same work could be done more slowly by hand. However, the NUDIST manual claims that the program is more than a "code-and-retrieve" system in that it supports the emergence of theories.

The indexing data base can be of any level of complexity - from the flat lists of codes necessary for most code-and-retrieve programs, to highly organised and complex tree-structured indexes of categories and sub-categories. This structuring allows indexing concepts to be organised and managed as theoretical systems, not just as labels. (p. 7)

This program is not a solution to the debate about the comparative merits of quantitative and qualitative research paradigms, where the real questions are about more fundamental issues of validity, reliability and objectivity, as well as the nature of truth and our ability to know it - and eventually about how research can be used for human betterment (Bates, 1980, Carr & Kemmis, 1983).

USING NUDIST IN A CURRENT RESEARCH PROJECT

The research study employed in this paper to illustrate the use of NUDIST involved the distribution of a questionnaire to mathematics educators and teachers. This was aimed at identifying common beliefs about characteristics of quality mathematics lessons. The first item was an open-response item:

Throughout this survey we want you to imagine a mathematics lesson, at any year level, where the students are learning, for example, to estimate the mass of various objects, or to add fractions, or to record given information as a graph. Before turning the page, please write down the most important characteristics which a **quality** mathematics lesson on any of these concepts/skills would usually have.

Initially, all 125 responses to this question were typed. The NUDIST program produced a printout which identified the respondent's occupation, country, etc. For example, the response reproduced below (#2) was from a mathematics teacher studying a Graduate Diploma or Masters at Christ Campus.

```
*2                                                        1
GRAD DIP/MASTERS - CC                                    2

* QUESTION 1                                              3
The characteristics would include physical involvement, some    4
co-operative learning, discussion, problem solving and risk taking    5
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Each phrase in each response was then categorised by hand under general categories and sub-categories, using a rudimentary taxonomy (verbal, then later numerical) which developed as we worked together on this task. Initially, classifications such as "teacher's work (1)" and "pupil's work (2)" were created. Sets of subsidiary ideas were then categorised into nodes under these classifications. Using the same example, below, the first 2 relates to the classification "pupil action". The next two figures indicate a node (12 was "Content and activities", and 13 was "Interaction"). The remaining figures designate sub-nodes (e.g. 1 was "discussion between pupils", and 17 was "investigations/ problem-solving").

physical involvement	2	12	3		4	
co-operative learning	2	12	3		5	
discussion	2	13	1		6	
problem solving	2	12	17		7	
risk taking		2	12	8		8

A small section of the conceptual framework which developed would thus appear as:
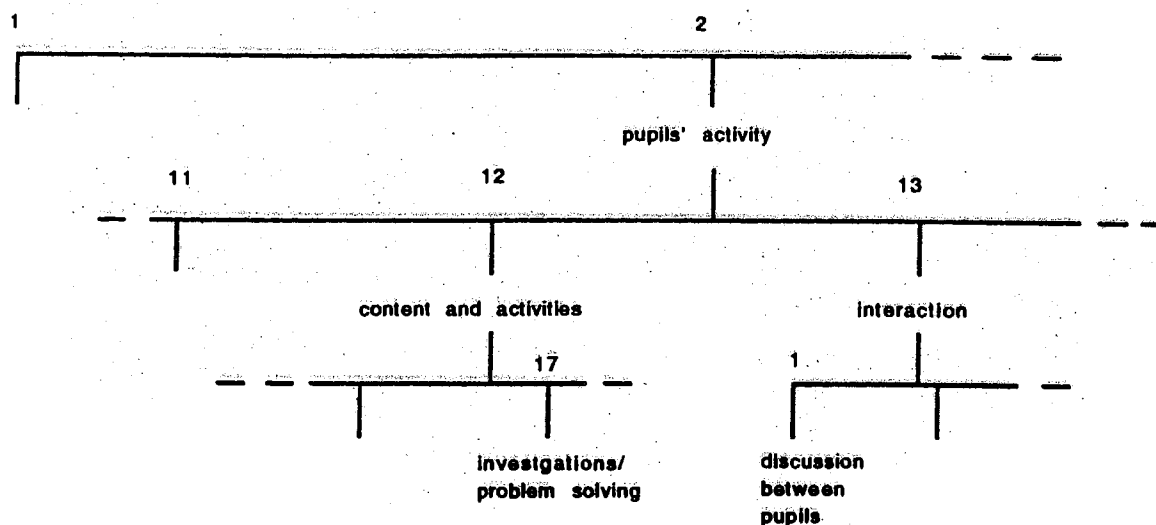
Key words and common phrases were useful in deciding on how to classify phrases. For instance, "sharing ideas", "time for sharing perceptions", "sharing alternative solutions" and "listening to alternative solution strategies" seemed to be linked by common words as well as conceptually, so were all classified as *sharing strategies*. At times it was necessary to add further categories, or to split one as it became apparent that two distinctive groups of data were developing from one category.

This stage of the process was time-consuming but enlightening. There were some lively debates about possible interpretations of responses, and the meanings of jargon such as "non-threatening". We also discussed whether the structure arising was largely pre-determined either by our own pedagogical notions or by the wording of the original question. There was also concern about practicalities such as the effect of including a phrase in two different classifications or whether a term and an example of what was meant should be included as two entries.

Classifications were then typed against each phrase, and NUDIST was used to group phrases together under the taxonomy of headings created. The result was printed out. As an example of what was produced, two sub-nodes had the following amongst their data:

THINKING (2 12 18)

Aims to develop understanding opportunity for student thinking
Lesson requires thinking rather than repetition and mimicking
Promotes thinking
Lots of thinking by students about task
Speculating on how best to solve them and solving
Thought about the problem

CHALLENGING (2 12 9)

Challenging
Challenging task w/i reach
Challenging activities
Challenge
Should have ability for extension
Challenging but caters for individual differences

The collections of phrases were then re-examined to determine whether they formed a coherent set, and descriptors were moved if necessary.

On reviewing the data at this stage, it became clear that the headings used originally (teacher actions, content and activities, etc.) were not suitable for synthesising major features of quality lessons. Arranging sub-nodes around the main characteristics appearing led to the formation of six categories, tentatively called *Communication, Problem solving, Building understanding, Engagement, Task orientation* and *Teacher Qualities*. Thus a new taxonomy was formed:
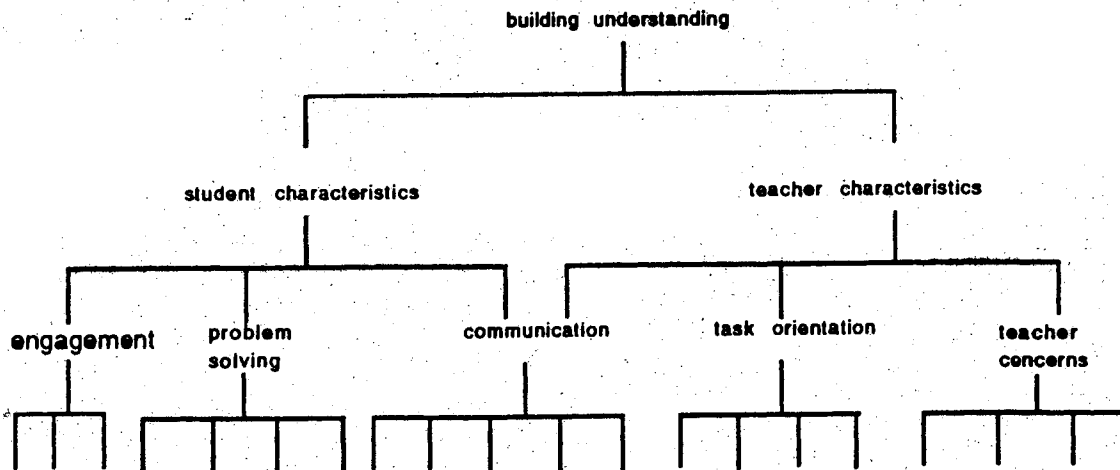
Strangely, this analytical exercise taught us as much about our own (as well as each others') concepts of quality lessons, and about the act of writing a questionnaire item as it did about the beliefs of our colleagues. We also learned a lot about the way different phrases are used in describing teaching and were reminded continually of the vagueness of most of the terms used. (What, for instance, is "real-world activity" and what are the reasons for it to be included in a mathematics lesson?) It is now hoped to use this data to engage people in further discussion about the appropriateness of the categories formed and about the possibilities of developing a more common language for describing teaching.

A most important feature of this analysis process is that the original data, as typed, is still accessible for easy comparison with new data - or for replication of the process (perhaps with new conceptual frameworks). While the final printout only showed our classifications at each level, each stage of the process (from raw data on) has been saved and is thus open to examination or re-working. With NUDIST, a log of changes is kept automatically. A history of what was done therefore forms the basis for keeping a record of, and retracing if desired, the research process.

THE ACT OF CLASSIFICATION

Categorisation has the benefit of focusing data and enabling it to be reduced to a state where it can be analysed in terms of quantity, discussed under broad headings or compared with other data. However, classification involves an orientation and rebuilding - and hence modification of - the original data. While the intention of the researcher might be to keep as close as possible to the intention of the contributor of a given phrase, two factors impinge on this process. First, the act of categorisation is by its very nature subjective. Selection of orienting categories depends on researchers' personal constructs of the task at hand. These, in turn, are shaped by perceived possibilities within the fields of research and educational theory and then by a developing notion of the overall "findings". Second, phrases and terms used to describe teaching and learning are themselves attempts to capture nebulous qualities and ways of behaving. These are used in various ways according to participants' prior experiences and understandings as well as their perceptions of audience. To place phrases within categories is to assume a meaning and perhaps to "bend" the data to fit with other data. As with most analysis of qualitative data, factors (such as inflection and body language) which would assist the accuracy of placement or summation are lost in the transcription process.

Problems related to the subjective nature of decision-making and interpretation of human beliefs and actions are not in any way specific to the use of NUDIST. Hermeneutic action is common to all research methods. Giddens (1984) notes that meaning is framed as individuals view the real world in terms of their personal understandings and that these interpretations are made in the light of their understandings of the theories, ideas and concepts developed by researchers in their fields. Further interpretation takes place as the ideas are published and take new form in the praxis of everyday social use. Such "moments" of decision-making are not so apparent in empirical research but are still present and attempts to control such factors bring their own set of limitations to research projects.

One group of questions raised in our discussions about the use of tools such as NUDIST related to how we, as educational researchers, make judgements regarding what information to seek, how to seek it, how to analyse it, then how to use it. We discussed how these decisions are influenced and limited by our own socio-cultural history as well as by our individual professional histories, personal understandings and current needs. Another group of issues raised was about the sharing of findings and what is considered by a researcher to be worth sharing. What is withheld from the reader? How do we share our findings with particular audiences, and is this done selectively? How accessible are the ideas presented to the consumers and producers of educational theory-in-use, i.e. teachers in classrooms? How can all of this fit into eight pages? There was also discussion about how we raise the issues of the problematic nature of judgements that have been made during the research process. At each stage of the process, decisions were being made about how to handle the data in its current form, but in most research reports, the nature of this decision-making is not presented as problematic.

The experience of thinking about the research processes undertaken has sensitised us to the workings of heumeneutics within educational research. The act of interpretation is ever new. Starting points and further developments, analysed and theory, conceiving and reconceiving, part and whole, what-is-seen and what-is-to-be-seen: the interplays between these are ongoing. All reflect a process of gaining understanding - the heumeneutic act. The researcher is involved in a process of representation and creating boundaries, but of expanding horizons of understanding. However, readers of published articles rarely see them as artistic creations: pictures of the educational researchers' experiences, intentions and growing conceptions. And the act of reading a research report in many ways parallels the creative acts of the researchers themselves.

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