USING NUDIST TO MODEL MATHEMATICS TEACHER PERSPECTIVES*

Peter Gates

University of Nottingham

Abstract

Qualitative research is a creative process involving categorisation, organisation and theorisation, a cognitive, creative process rarelY made explicit. It is a crucial activity wherein empirical research data is transftrmed into a descriptive, analYtical or theoretical plane Making sense of data might involve index cards, scissors, glue and lots of floor space, as we form categories, allocate text units, reorganise and theorise. It is now possible to use software that offers flexibility, speed and power to do this. One programme, **NUDIST** *(Non-numerical Unstructured Data. Indexing, Searching and Theorising) and is claimed to be one of the best thought-out programs around I describe and discuss my use of NUDIST in developing an embedded cfynamic model of mathematics teacher perspectives based upon the coding of in-depth interoiews.*

Background

> We do not simply "collect" data; we fashion them out of our transactions with other men and women. Likewise we do not merely report what we find; we create accounts of social life, and in so doing we construct versions of the social worlds and the social actors that we observe. It is therefore inescapable that analysis implies representation.
>
> (Coffey and Atkinson 1996, p 108)

Qualitative research is a creative process involving categorisation, organisation and theorisation, yet this cognitive, creative process is rarely made explicit. It is however a crucial activity wherein empirical research data is transformed into a descriptive, analytical or theoretical plane. The process of making sense of data might involve index cards, scissors, glue and lots of floor space, as we attempt to form and reform categories, allocate text units, reorganise and theorise. It is possible to use computer tools for this, which offer flexibility, speed and power. One such programme is **NUDIST,** which stands for *Non-numerical Unstructured Data* Indexing, Searching and Theorising, (Richards and Richards 1991a; Weitzman and Miles 1995; Gahan and Hannibal 1998) is claimed to be one of the best thought-out programs around (Weitzman and Miles 1995, P 238). The programme is a strong tool for storage, coding, indexing, structuring retrieval and analysis of text and particularly supports theory building through its data coding, indexing and conceptual tree structure. In addition, it has "by far the most extensive and powerful set of codebased operators around" (Weitzman and Miles 1995, p 248).

Two of the particular requirements of a qualitative researcher in dealing with data is attaching codes to segments of text and connecting these codes or categories into some convincing and discernible structure (Tesch 1991, p 27 - 28). The intention is to *"make assertions regarding the structure or linkages, or relate concepts in order to discover the*

underlying principles" (Tesch 1991, p 28). This process of theory construction is preferable to the use of illustrative juicy quotes, which are claimed to represent positions or arguments but

> very often the interviews only appear as quotations, illuminating the researcher's own narrative, so that the reader is left wondering how the discourse of the interviews was transformed into the discourse of the report.
>
> <div align="right">Gensen 1989, P 100)</div>

A response to this is to demonstrate the trans formative weaving together of interview data into analysis and description. This makes for somewhat longer, but more engaging and believable accounts. The use of a powerful software tool for coding, indexing and organising can make the often painful process of data organisation and theory construction, less of a mechanical chore and more a creative act of modelling and can furthermore enhance the construction of reports.

Using NUDIST

I have used NUDIST to develop an embedded dynamic model of mathematics teacher perspectives. This paper is one way in which I can expose my work to critical communal scrutiny by exposing what Janice Morse (Morse 1994) calls the *"mysterioul'* process of qualitative data analysis:

> The actual cognitive processes inherent in analysis, processes of synthesization that lead to the aggregation of categories, strategies for linking categories, and decisions and processes of falsification and conformation in theory development remain mysterious to all but the qualitative researcher.
>
> <div align="right">(Morse 1994, pps 23 - 24)</div>

It is important to *"make explicit the cognitive struggle of model or theory construction"* (Morse 1994, p 24), because the process of research is not a neutral activity, but a political one. Theory does not 'emerge from the data'; it is fashioned, hewn, moulded. In this process one needs to undergo a process of *"making the invisible obvious, of recognising the significant from the insignificant, of linking seeming!J unrelated facti'* (Morse 1994, p 25).

I worked with a teacher - Alan Brown, a Head of Mathematics - over almost one year, regularly interviewing him and observing his lessons. I was interested in identifying the different ways in which teachers conceptualised, described and justified their work. Having transcribed and familiarised myself with the data for each interview, I transformed it into a two-column format for the purposes of making notes and comments for an initial exploratory analysis. I spent time reading, and rereading the interview - sometimes along with the tape. I then began to highlight certain phrases, responses and devices, which seemed to represent themes and patterns. I then wrote notes in the right-hand column, which would turn into the analysis. I carried out all the coding and analysis of Alan Brown's first interview

by hand. This was an important phase because it allowed me to get a feeling for the coding and interpretation process. However, from there on, I used NUDIST as my research tool. For each transcript I had preliminary notes and had carried out a preliminary analysis that influenced my general direction in making sense of the context of my research data. I then imported each transcript into NUDIST and worked on coding each in more detail. The process involved *browsing* each interview transcript several times, *coding* each time according to the various themes which were evolving and *crafting* or organising the thematic index system. The analysis was supported thereafter by *searching* and *questioning* the database constructed by the coding (Gahan and Hannibal 1998).

Issues in Using NUDIST

A tool-kit such as NUDIST does not replace or reduce the role of the qualitative researcher. What it does do is make the researcher more efficient and potentially more powerful. It not only brings one close to the data, but also keeps one close to the coding scheme and consequently the *developing* model. There are a number of tasks a qualitative researcher undertakes, and which are supported, assisted and extended in NUDIST:

- Seeing the story in complicated data and finding what's going on;
- Sorting data into themes so that all about one theme can be viewed altogether;
- Locating key works or phrases, sorting and storing them so they can be reviewed;
- Linking ideas together;
- Comparing groups to see how they are different;
- Making categories for thinking about the data to see more general shapes in the data;
- Using categories to code data and examining each category to see what it is referring to;
- Dong the data justice - not just summarising, but really exploring;
- Re-coding or resorting data which no longer "fits" where it was previously categorised;
- Looking to see if there are linkages between categories or themes;
- Managing or knowing where all the data is, so it doesn't become lost.

(Gahan and Hannibal 1998, p2 - 3)

One particular advantage I found was the way in which NUDIST supported the creative process of model building by helping me to *"shift, delete and combine indexing categories in w~s that make it ea.ry to treat the indexing .rystem as an image of one's thinking'* (Richards and Richards 1991 b, P 311). However, coding is also a dynamic process of integrating my theoretical framework into the data. For me this is the creative essence of qualitative modelling. The faster and more powerful coding, linking, searching and organising features allows me to try out, test, reject and incorporate new ideas, connections and constructs.

> Coding is much more than simply giving categories to data; it is also about conceptualising the data, raising questions, providing provisional answers about the relationships among and within the data, and discovering the data

(Coffey and Atkinson 1996, p 31)

Modeling the Data

Hence I looked for conflicts and contradictions in the data, as well as looking for *"patterns, themes and regularities as well as contrasts, paradoxes and irregularitiel'* (Coffey and Atkinson 1996, p 47). Coding all of Alan's data eventually gave me the following tree structure. (This represents the "I" stage). The 'Main Nodes' (or categories) were those which evolved from both interview and the lesson observation data. The 'Free Nodes' were those that appeared to be significant features of the data, yet which seemed to represent the way in which Alan was presenting his positions rather than elements of the positions themselves.

Main Nodes
(1)	Management Style
(2)	Children's Needs
(2 1)	Children's Needs - of less able
(2 2)	Children's Needs - of more able
(3)	Curriculum Organisation
(3 1)	Curriculum Organisation - Nature and Purpose of Mathematics
(4)	Control
(5)	Monitoring
(6)	Assessment
(7)	Setting
(8)	My Role in the School
(8.1)	as a teacher
(8.2)	as a manager
(9)	Social distinctions
(10)	Valuing the practical

Free Nodes
(F1)	Metaphors
(F2)	Separation

The next stage of the analysis consisted in exploring the content and interconnections between the Main Nodes as well as the way in which nodes were embedded in others. The Free nodes were explored also for their significance. Initially I had "Pragmatism" as a free node, since I felt it merely represented a linguistic feature wherein Alan talked about issues by referring to his everyday experience. However by looking more closely at the content of the node, I felt that it actually represented a deeper construct-that of "VaIuing the Practical". Consequendy I moved it into the set of main nodes and looked at how it related to the other main nodes. It is this stage which uses the powerful searching facilities in NUDIST. (This represents the "S" stage). The on-line interactive features of NUDIST means that I can search for where this node intersects with all others and how it is embedded hierarchically; I can see where it does not appear. The first stage in this process is reading and re-reading the node printouts to get a sense of the nature and structure of the themes. (This is the beginning of the "T" stage).

Within the categorisation of the data, there were levels of mutually exclusive but embedded categories. For example, the four categories Setting by Ability,

Assessment, Monitoring and Curriculum Organisation only had one occurrence in total as overlap. This was between *Curriculum Organisation* and *Assessment.* There was a second set of categories that again between them only had two occurrences as overlap. These categories were Children's Needs, My Role in the School and Management Style, where the overlap occurred between *My Role in the Schoof* and *Management 5 tyfe:* However these categories were also embedded within the previous four categories. A third set of categories that were exclusive were Control, Social Distinctions and Valuing the Practical. In this case, there was no example of cross coding, yet again there was evidence of embeddedness suggesting that these were more deeply embedded across various element of Alan's perspectives. At this stage, I was happy that my constant comparative coding had produced such a structure. However, I felt uneasy about my coding of Control since it was by far the largest theme in terms of coded units - almost twice as frequent as the next largest - Children's Needs. This needed some further reanalysis and subdivision. I printed out the Control node, cut it up and tried to identify patterns and sub-themes. Eventually I came up with six: surveillance over others, making decisions about others, the need for uniformity, differentiating between individuals, discipline and conformity, and the importance of hierarchy.

This then gave me a structural model of themes, on which I then worked, to develop a theoretical model drawing on Foucault's notion of discursive formation and Bourdieu's habitus. An external *discursive /evel of perspectives* consisted of "setting by ability", "assessing pupils", "monitoring" and "curriculum organisation", which related to how the department operates, how it organises, stratifies and differentiates pupils. *Mediating influences* consist of "satisfying children's needs in learning", "my role in the school" and "my management style", which are related to influences on pedagogy and relationships with others. Finally *personal dispositions* consist of "social distinctions", "valuing the practical" and "control", which are all related to deeper issues of values. From this structure I further synthesised what I felt were underlying influences on Alan and which helped to create some framework, or some sense of deeper structure and cohesion. There were three main consistent themes that underpin Alan's positioning surveillance, hierarchy and conformity.

Surveillance incorporates the need to oversee, check and organise others. This is not perceived as a repressive or oppressive force, but as a creative one, which ensures individuals perform at their maximum capacity.

Hierarchy is an essential feature that allows individuals to operate together. For those in relative subordinate positions, it incorporates the need to subordinate oneself to others, who are legitimately empowered to take decisions about for and on behalf of those in subordinate positions. The essential feature is that this is a top down principle wherein democratic accountability does not figure. Hence those in

super-ordinate positions are empowered with the legitimacy to make such decisions over others.

Conformity is important for the smooth running of the school, department and classroom. This incorporates acceptance of externally imposed conditions and suppression of individuality. This appears in the management of others and in the processes of learning.

There is a strong coherence between these elements, which form a mutually supportive and justificatory framework. The need for acceptance of hierarchy is both required and reinforced by the process of surveillance, whereas conformity is assumed in order for the system to effectively operate. It would appear that in the way they operated for Alan, there was little dialectical conflict in these components. Not only is there consistency in application, there is also a high level of integration as a system of social organisation. Most notable, underlying Alan discursive structural organisation are fundamentally social constructs which would help us in determining some deep ideological influences upon teacher classroom practices.

(*) lbis paper is a companion paper to "Mapping discursive structure. Working with habitus, discourse and ideology to explore the politics of mathematics teaching" which appears elsewhere in this volume.

References

Coffey, Amanda and Atkinson, Paul (1996) *Making Sense of Qualitative Data. Complementary Research Strategies,* London, Sage.

Gahan, Celia and Hannibal, Mike (1998) *Doing Qualitative Research Using QSR NUDIST,* London, Sage.

Jensen, Klaus (1989) "Discourses of Interviewing. Validating Qualitative Research Findings Through Textual Analysis" in Kvale, Steinar (Ed.) *Issues of Validity in Qualitative Research,* Lund, Sweden, Studentliteratur, pps 93 - 108.

Morse, Janice (1994) ""Emerging From the Data": The Cognitive Process of Analysis in Qualitative Inquiry" in Morse, Janice (Ed.) *Critical Issues in Qualitative Research Methods,* London, Sage, pps 23 - 43.

Richards, Lyn and Richards, Tom (1991a) "The Transformation of Qualitative Method: Computational Paradigms and Research Process" in Fielding, Nigel and Lee, Raymond (Eds.), *Using Computers in Qualitative Research,* London, Sage, pps 38 - 53.

Richards, Tom and Richards, Lyn (1991b) "The NUDIST Qualitative Data Analysis System", *Qualitative Sociology,* Vol: 14, No: 4, pps 307 - 324.

Tesch, Renata (1991) "Software for Qualitative Researchers: Analysis Needs and Program Capabilities" in Fielding, Nigel and Lee, Raymond (Eds.), *Using Computers in Qualitative Research,* London, Sage, pps 16 - 37.

Weitzman, Eben and Miles, Matthew (1995) *Computer Programs for Qualitative Data AnalYsis,* London, Sage.