An Introduction to Qualitative Research

UK Physical Sciences Centre

Introduction

As scientists we are often more comfortable with the concept of quantitative research than qualitative research. Quantitative methods usually deal with the collection and processing of numerical data and can be described as

> *"the means for testing objective theories by examining the relationship among variables. These variables, in turn, can be measured [...] so that numbered data can be analysed using statistical procedures."*[1]

Qualitative research can provide insight which is not possible to elucidate with purely quantitative methods. It can be described as

> *"a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem. The process of research involves emerging questions and procedures, data typically collected in the participant's setting."*[1]

The simplistic view is that qualitative research deals with the collection of non-numerical data. This does not necessarily mean that qualitative data cannot be quantifiable in a qualitative project and interviews and questionnaires, for example, may yield quantifiable data. Interpretability is a defining feature of qualitative data and, although some of the data generated may be quantifiable, the bulk of the analysis is usually interpretative.[2] With qualitative research there is no single method, but a choice of methods appropriate to a variety of different topics and research questions.[3]

Qualitative Worldviews

There are many different philosophical approaches to qualitative research which influence the choice of theoretical framework and methodology. These philosophies are described as worldviews, as shown in figure 1.

Figure 1: Qualitative worldviews

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The two world views that are perhaps most encountered in science education are:

Positivism: Holds the view that a scientific approach can be used to understand both the physical world and human interactions. It is the world view most often held by scientists starting out in pedagogic research and quantitative methodologies often follow from it.[4]

Constructivism: Holds the view that humans generate and construct their own knowledge and understanding from their interactions with the world around them.[5]

Theoretical Frameworks

Theoretical frameworks are different structures around which research can be designed and conducted. There are a number that are used in qualitative research. We briefly describe some of them here.

Grounded Theory: The term grounded theory was used in 1967 by Glaser and Strauss.[6] In grounded theory data is gathered and analysed and the theory derives from that data. This is in contrast to frameworks that put together a theory from a series of observations or concepts and then gather data to test to theory. It is believed that grounded theory develops theories that are closer to reality.[3]

Ethnography: The idea behind ethnographic research is that the researcher observes the actions of the research subjects with respect to time.[7] The data must be collected within what Hammersley and Atkinson describe as “natural settings”, environments that have not be adapted or modified for the purpose of the research.[7]

Phenomenography: A framework that investigates the number of qualitatively different ways that people experience something or think about something. It assumes that there are always a limited number of these. Behaviour is studied without researcher influence.[8]

Phenomenology: Within the physical sciences, phenomenological theory is prominent and is described as

> *“a theory which expresses mathematically the results of observed phenomena without paying detailed attention to their fundamental significance.”*[9]

In philosophy the term is used to describe the study of structures of experience or consciousness, appearances of things, or the ways we experience things. If phenomenography studies the different ways people experience something, phenomenology can be thought of as the study of the common ways in which people experience something.

Reflexivity: The issue of reflexivity arises from the subjectivity of the researcher in the act of engaging with the research process. The subjectivity of the researcher becomes ingrained in the research process itself.[10] Reflexivity highlights the reflection of a researcher’s actions on the data obtained.[10]

Conducting qualitative research

There are many methods by which qualitative researchers seek answers to their research questions.

Interviews: Using Patton's definition, an interview consists of:

> *"Open-ended questions and probes yield in-depth responses about people's experiences, perceptions, opinions, feelings, and knowledge. Data consists of verbatim quotations and sufficient content to be interpretable."*[11]

The two main interview styles structured and unstructured.

Structured interviews**:** Rely on the researcher having a structured schedule or crib sheet to follow, with closed questions.[12] This does not allow for much improvisation and the interviewer is often testing a theory. If further clarification is required on a certain answer given by a respondent, a further set of interview questions could be produced and a follow-up interview conducted. It is possible to investigate whether the opinions of the interviewee alter with time by carrying out a longitudinal series of interviews, with a means of categorising and potentially statically analysing any results through means of coding.[13]

Unstructured interviews: May begin with defined questions but then can change and evolve to respond to the interviewee's experience. Thus, there is more opportunity for the interviewer to probe around the interviewee's responses.

Focus Groups: Morgan stated that focus groups can serve as a primary means of collecting qualitative data.[14] Focus groups are effectively unstructured interviews where the interviewees are free to interact with each other. The facilitator must motivate and consider all members of the focus group and encourage even the quiet ones to contribute, in some instances adopting an interventionist style.[15]
The data obtained from interviews and focus groups can be analysed by coding and has the potential for quantification.

Questionnaires: Questionnaires are used to gather the opinions of a larger group of people than would be able to be reached by interview or focus group alone. There are factors that must be taken into consideration when designing the questionnaire; designing questions which can result in qualitative as well as quantitative data. Quantitative data falls into the following categories:[16]

- Interval – equally split data, e.g. temperature (Fahrenheit scale)
  Has natural ordering
- Nominal – named categories, e.g. gender, home town
  No natural ordering
- Ordinal – generally a ranking, e.g. Likert scale, "rate on a scale of 1-5"
  Has natural ordering
- Ratio – interval data with natural zero, e.g. time, temperature (Kelvin scale)
  Has natural ordering

Observations: An extremely useful tool in both quantitative and qualitative research is that of observation. Patton describes the process of observation as:

> *"descriptions of activities, behaviours, actions, conversations, interpersonal interactions, organisation or community processes or any other aspect of observable human experience."*[11]

The data from observations consist of detailed descriptions and the context within which the observation was made.

Discourse analysis: Discourse analysis analyses the language in text, conversation, documents, diaries, portfolios etc. The aim is not to analyse the structure of the text but to reveal something about the persons.[17]

Coding: Coding is the term used to describe the conversion of raw data obtained from interview and focus group transcripts or questionnaires into usable qualitative or quantitative data by categorization. This process of coding and finding themes can be simplified by the use of software such as NVivo <www.qsrinternational.com/products_nvivo.aspx> for interview transcripts, and questionnaire analysis can be aided by the use of SSPS <www.spss.com/uk/>, which are both available in most HEIs.

An example of a good starting text for SPSS is Discovering Statistics Using SPSS published in 2009 by the author Andy Field.
There are no definitive starting texts for NVivo, which requires more of a tutorial approach to understand and be able to use the software. There are a variety of tutorials available for NVivo on the developer's website: <www.qsrinternational.com/support_tutorials.aspx?productid=20>
For both software packages, there are a number of websites offering tutorials and advice on the basic and more advanced features available within each.

Ethical Considerations: Because pedagogic research involves humans the ethical considerations are potentially more problematic than for research in the physical sciences. Typical issues to consider are; does the study advantage or disadvantage some students over others, is the anonymity of the research subjects preserved, is the researcher influencing the outcomes of the research? Advice on ethical considerations may be available from an institutions department of education or social sciences.

References

1 Creswell, J. (2009) 'Research design: Qualitative, quantitative, and mixed methods approaches', Sage Publications Ltd.
2 Strauss, A. and Corbin, J. (1990) 'Basics of qualitative research', Sage Publications Ltd.
3 Flick, U., Von Kardorff, E., and Steinke, I. (2004) 'A companion to qualitative research', Sage Publications Ltd.
4 Wacquant, L. (1992) in Outhwaite, W., Bottomore, T. B., Gellner, E., Nisbet, R. A., and Touraine, A. (1993) 'The Blackwell dictionary of twentieth-century social thought', Blackwell.
5 Matthews, M. R. (1993) *Journal of Science Education and Technology*, **2**, 359.
6 Glaser, B. and Strauss, A. (1967) 'The discovery of grounded theory: Strategies for qualitative research', Aldine.
7 Hammersley, M. and Atkinson, P. (2007) 'Ethnography: Principles in practice', Taylor & Francis.
8 Marton, F. (1981) *Instructional science*, **10**, 177.
9 Thewlis, J. (1973) *Concise dictionary of physics., by Thewlis, J.. Oxford (UK): Pergamon Press*, **1**.
10 Flick, U. (2009) 'An introduction to qualitative research', Sage Publications Ltd.
11 Patton, M. (2002) 'Qualitative research and evaluation methods', Sage Publications Ltd.
12 Arksey, H. and Knight, P. (1999) 'Interviewing for social scientists: An introductory resource with examples', Sage Publications Ltd.
13 Von Eye, A. and Niedermeier, K. (1999) 'Statistical analysis of longitudinal categorical data in the social and behavioral sciences: an introduction with computer illustrations', Lawrence Erlbaum.
14 Morgan, D. (1997) 'Focus groups as qualitative research', Sage Publciations Ltd.
15 Kitzinger, J. (1994) *Sociology of health and illness*, **16**, 103.
16 Opie, C. (2004) 'Doing Educational Research', Sage Publications Ltd.
17 Brown, G., Yule, G. (1983) 'Discourse Analysis', Cambridge: Cambridge University Press.

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