Jackson, Elizabeth (2009) Justifying a phenomenographic approach to investigating primary student teachers' perceptions of mathematics. In: Research FEST 2009, July 2009, University of Cumbria. (Unpublished)

Justifying a **phenomenographic approach to investigating primary student teachers' perceptions of mathematics**

Elizabeth Jackson
elizabeth.jackson@cumbria.ac.uk

Abstract

This paper outlines the planning of a phenomenographic study, as part of
a doctorate in educational research, in exploration of primary student teachers'
perceptions of mathematics at the outset of Initial Teacher Education.
It is intended to be of interest to past, current and future researchers
in terms of the use of phenomenography as a research approach.  It addresses
both strengths of the approach for the intended study, and limitations, with
justification provided for the methodological choices made.

This study is designed to explore primary student teachers' perceptions of mathematics at the outset of Initial Teacher Education (ITE).  It is based on a personal interest in the ways in which students' experiences of mathematics might lead to their perceptions of mathematics and the impact those perceptions may subsequently have on their learning of mathematics for ITE.

The research foci are:

*to determine the range of variation in perceptions of mathematics for student primary teachers at the outset of Initial Teacher Education.*

*to provide an epistemological review of findings to enable student primary teachers to reflect on their pragmatic application*

A strength of the design is the use of phenomenography as the research approach since mathematics involves a qualitative experience, based on conceptual understanding arising from mathematics in everyday life and educational environments, and phenomenography "*is based on a relational view of the world*" (Bowden, 2005, p11).  From an ontological perspective, this study takes a non-dualist ontological stance whereby the object [mathematics], and the subject [the person engaging in mathematical activity], are not separate.  The focus for the study is the relation between mathematics and the students, that relation being the perceptions they have of mathematics.  Epistemologically, that relational perception might then have an impact on subsequent engagement with mathematics for students' ITE learning.  Hence, to ascertain the range of variation in perceptions held by such students could be useful for students to reflect upon, and a literature review will be used to provide epistemological evaluation of the findings pertaining to the range of variation of perceptions that arise from the study.  A research method is needed whereby a process of induction can be used, starting with elicitation of students'

descriptions of experiences and perceptions, to then reach an understanding of the range of variation. Rather than having a hypothesis to test, my aim is to find out what mathematical perceptions students bring with them to an ITE course, and hence need to be able to start with data and *"move up conceptually"* (Green, 2005, p35), for which a phenomenographic methodology is valuable.

A drawback to the use of phenomenography has to be carefully considered in that there is argument that analysis should be carried out as a team (Walsh, 2000). This is neither logistical nor welcomed as this research is an individual project for a doctoral thesis, but my decision to go it alone is supported by Green (2005, p43) who purports that *there are phenomenographers who work alone on their analysis."*

Ashworth and Lucas (2000) suggest that there has been criticism of phenomenographic method, largely due to a lack of recording of the actual process and I therefore plan to include clear definition of the methods undertaken to uphold its validity and avoid any potential criticism for a lack of theoretical background (Marton and Tsui, 2004). Since this phenomenographic study is qualitative, based on students' descriptions of their experiences and interpretation of their perceptions, it is open to critics who argue that, as such, it may be unreliable, invalid and not generalisable (Kvale, 1996). In order to ensure a rigorous approach, decisions and careful plans will be made from the outset (Green, 2005, p45).

A second order perspective will be maintained throughout, an essential element of phenomenography, in that the emphasis is on trying to see the phenomenon through the students' eyes. This is not straightforward (Prosser, 2006), and is an aspect open to criticism by those who claim it to be impossible to set aside one's own preconceptions in order to remain open and unbiased to others' descriptions and reach an understanding of what they say (Ashworth and Lucas, 2000). It is recognised that I have my own thoughts on the phenomenon, as well as some relationship to the students, and so it is imperative that a conscious decision is made to focus on eliciting students' perceptions without bringing into the process my own perceptions of mathematics, and certainly not imposing my own views upon the students. With this in mind, a detailed substantive literature review will not conducted until the data are collected and analysed. The rationale for this is that an initial focus is necessary in the first instance for data to be collected, but that there will be insufficient detailed reading of theoretical perspectives to facilitate leading questions.

A strength in method is the use of interviews which I consider will give the richest means by which students' perceptions can be explored via their accounts of experience. However, the second order nature of this generation of data is flawed, according to Saljo (1997), on account of the difference between actual and described experience and the limitations of discourse. His argument is that it is the language that is examined as opposed to direct experience. My counter argument is that even if direct experience were to be the source, it would still be dependent on some sort of subjective observation by the researcher, and I deem the students' descriptions to be more reliable than a researcher's interpretation of their direct experience.

Reliability of the study will be strengthened by careful planning of the process of data collection and in line with the ethical guidelines of both the university where I work and my doctoral

university. Students will not be under any obligation to take part in the research, will not be students I would be teaching so that they will not feel pressure to appease their tutor and anonymity will be assured. Signed consent will be required, including permission for interviews to be recorded. The interviews will be carefully planned without prior bias and to avoid adding any "*concepts or ideas to the interview in an unplanned way*" (Green, 2005, p36), the questions will be open-ended so that responses are more likely to refer to the participants' perceptions relevant to their experience. Validity will therefore be increased by this careful choice of questioning together with the accurate records of both responses and questions being available for confirmation. Once all interviews are conducted, each will be transcribed verbatim (Trigwell, 2006) and any transcripts found to be tainted by my own ideas will not be used, which is recognized procedure (Green, 2005). Transcripts will be read and re-read and as similarities and differences become evident, draft categories of description will be constructed and developed over a period of iteration, which supports the rigour of the phenomenographic approach (Akerlind, Bowden and Green, 2005).

However, there is debate amongst phenomenographers (Dunkin, 2006) regarding whether the whole transcript is considered (Trigwell, 1994), or large excerpts related to particular issues (Prosser, 2006), or smaller excerpts seen to represent particular meanings (Marton, 1986). If whole transcripts are used, once categories are formed, transcripts are analysed to see which correspond (Prosser, 2006), and rather than using verbatim excerpts, the "*spirit of the quotes*" is used (Trigwell, 2006, p78). I prefer to use the exact wording from the students to let "*the concepts and terminologies of the interviewees speak for themselves*" (Barnacle, 2005, p49) and consider this method reliable in terms of consistently reflecting both the meaning and the evidence, and constructing categories from what emerges from the responses, as supported by Åkerlind (2005a). Whilst Bowden (2000) claims that to use excerpts is more abstract and less meaningful, I believe it will allow concentration on the detail of what the students have to say rather than being clouded by the wealth of data in the whole transcript, and meaning will be maintained by constant rereading and checking of the transcripts. Whilst the categories are constructed from the pool of data, they are constructed **by** the researcher (Walsh, 2000) and as such it may be inevitable that the process is therefore open to "*researcher bias*" (Walsh, 2006, p29). To defend the validity of this study, I will remain as objective as possible, making a conscious effort to do so throughout the process of analysis, and make every attempt to use the evidence from the data to form the categories of description.

Phenomenography involves the identification of logical relationships between the categories to form an ***outcome space*** (Marton and Booth, 1997). To make decisions in structuring categories, the researcher's knowledge, understanding and personal perspectives means this is open to interpretation (Walsh, 2000). To ensure validity in this part of the process, the notion of bracketing will again be adhered to as far as possible, whereby "*neither categories of description not structural relationships are anticipated in advance of the data*" (Åkerlind, Bowden and Green, 2005, p98). There are different approaches used by pheonomenographic researchers since some consider the logical structure of categories at the outset and/or during the constructing the categories, as evidenced by Åkerlind, Bowden and Green (2005, p98). There is danger in this approach of the researcher's relation to the phenomenon detracting from the focus of the study (Åkerlind, Bowden and Green, 2005) and my choice is therefore not to focus on structure too early in the analysis, in order to avoid imposing my own ideas (Ashworth & Lucas, 2000) and

instead to form the categories of description first before considering links between them (Bowden, 2005, p15).

My intention is to strengthen the reliability of my study through honest representation of my interpretations, findings presented in an understandable form and a persuasive account of method to support the findings (Åkerlind, 2005a, p124). Whilst phenomenography does not seek to generalize, it is expected that *"the range of meanings within the sample will be representative of the range of meanings within the population"* (Åkerlind, 2005a, p104) and therefore its application considered. The first aim of this study is to determine the range of variation in primary student teachers' perceptions of mathematics at the outset of their ITE courses. The phenomenographic analysis will use all the transcriptional data to produce categories of description and an outcome space that does not reflect individual perceptions, but used as a pool of meaning to ascertain the range of variation for the group. The second aim of this study was to provide information via the categories of description and the outcome space for primary ITE students to use in increasing awareness of their perceptions, and for reflection, evaluation and analysis of their ITE needs. A phenomenographic approach, according to Åkerlind (2005b, p71) can be useful in providing practical application in such a way. Different perceptions of mathematics will exist for different students under different circumstances, but this study's outcome space will provide information for all primary ITE students to engage with since it provides a holistic perspective on collective experience, and *"the presentation of categories constructed through the phenomenographic process could act as a powerful trigger for such meta-reflection"* (Cherry, 2005, p59).

**Reference list**

Åkerlind, G. (2005a). *Chapter 8 Phenomenographic Methods: A Case Illustration.* In Bowden, J. A. & Green, P. (2005). *Doing Developmental Phenomenography.* Melbourne: RMIT University Press.

Åkerlind, G. (2005b). *Chapter 6 Learning About Phenomenography: Interviewing, Data Analysis And The Qualitative Research Paradigm.* In Bowden, J. A. & Green, P. (2005). *Doing Developmental Phenomenography.* Melbourne: RMIT University Press.

Åkerlind, G., Bowden, J. & Green, P. (2005). *Chapter 7 Learning To Do Phenomenography: A Reflective Discussion.* In Bowden, J. A. & Green, P. (2005). *Doing Developmental Phenomenography.* Melbourne: RMIT University Press.

Ashworth, P. & Lucas, U. (2000). *Achieving Empathy And Engagement: A Practical Approach To The Design, Conduct And Reporting Of Phenomenographic Research.* Studies in Higher Education, Volume 25, No. 3, p295-309.

Barnacle, R. (2005). *Chapter 4 Interpreting Interpretiation:A Phenomenological Perspective On Phenomenography. In* Bowden, J. A. & Green, P. (2005). *Doing Developmental Phenomenography.* Melbourne: RMIT University Press.

Bowden, J. (2005) *Chapter 2 Reflections on The Phenomenographic Team Research Process.* In

Bowden, J. A. & Green, P. (2005). *Doing Developmental Phenomenography*. Melbourne: RMIT University Press.

Bowden, J. A. (2000) *Chapter 1: The Nature Of Phenomenographic Research* in Bowden, J. A. & Walsh, E. (Eds). (2000). *Phenomenography.* Melbourne: RMIT University Press.

Cherry, N. (2005). *Chapter 5 Phenomenography As Seen By An Action Researcher* In Bowden, J. A. & Green, P. (2005). *Doing Developmental Phenomenography*. Melbourne: RMIT University Press.

Dunkin, R. (2006). *Chapter 9 Using Phenomenography to Study Organisational Change.* In Bowden, J. A. & Walsh, E. (Eds). (2006). *Phenomenography.* Melbourne: RMIT University Press.

Green, P. (2005). *Chapter 3 A Rigorous Journey Into Phenomenography: From A Naturalistic Inquirer Viewpoint.* In Bowden, J. A. & Green, P. (2005). *Doing Developmental Phenomenography*. Melbourne: RMIT University Press.

Kvale, S. [1996]. *Interviews: An Introduction To Qualitative Research Interviewing.* Thousand Oaks Sage Publications Inc.

Marton, F. (1986). *Phenomenography – A Research Approach To Investigating Different Understandings Of Reality.* Journal of Thought. Vol. 21. pp28-49.

Marton, F. & Booth, S. (1997) *Learning and Awareness.* Mahwah, New Jersey: Lawrence Erlbaum Associates.

Marton, F., & Tsui, A. (2004). *Classroom Discourse And The Space Of Learning.* Hillsdale, NJ: Lawrence Erlbaum.

Prosser, M. (2006). *Chapter 3 Using Phenomenographic Research Methodology In The Context Of Research In Teaching And Learning.* In Bowden, J. A. & Walsh, E. (Eds). (2006). *Phenomenography.* Melbourne: RMIT University Press.

Säljö, R. (1997). *Talk As Data And Practice – A Critical Look At Phenomenographic Inquiry And The Appeal To Experience.* in Higher Education Research And Development, 16, pp173-190.

Trigwell, K. (2006). *Chapter 5 A Phenomenographic Interview On Phenomenography.* In Bowden, J. A. & Walsh, E. (Eds). (2006). *Phenomenography.* Melbourne: RMIT University Press.

Trigwell, K. (1994). *The First Stage of a Phenomenographic Study of Phenomenography.* In Bowden, J. & E Walsh, E. (Eds). *Phenomenographic Research: Variations in Method*. Melbourne:RMIT. pp56-72.

Walsh, E. (2006). *Chapter 2 Phenomenographic Analysis Of Interview Transcripts* in Bowden, J.

A. & Walsh, E. (Eds). (2006). *Phenomenography.* Melbourne: RMIT University Press.

Walsh, E.  (2000).  *Chapter 2 Phenomenographic Analysis Of Interview Transcripts.*  In Bowden, J.A. & Walsh, E.  (2000). *Phenomenography.*  Melbourne: RMIT University Press.