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**Data analysis issues in a phenomenographic investigation into Information
Literacy in Nursing Practice**

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Abstract

Background: A doctoral research project is using phenomenography to investigate information literacy's role in evidence-based practice in nursing. This is a still uncommon, but increasingly employed qualitative interview-based methodology which allows experiences to be categorised and put into a descriptive structure for use in developing educational interventions.

Aim: A pilot study was undertaken to explore contrasting methods of data analysis to determine which is appropriate for the project.

Discussion: This article discusses the reasons for adopting this methodology, the epistemological assumptions of phenomenography and the strengths and weaknesses of differing data analysis methods.

Keywords: Phenomenography; Information Literacy; Evidence-based Practice; Data Analysis

Background: Information Literacy and Evidence-Based Practice

Information Literacy (IL) is a complex of knowledge and skills which allows the need for information to be recognised and the correct information located and used effectively and appropriately. SCONUL (The Society of College, National and University Libraries) define someone who is information literate as being able to 'demonstrate an awareness of how they gather, use, manage, synthesise and create information and data in a competent manner and will have the information skills to do so effectively.' (SCONUL 2011).

It is widely assumed that evidence-based practice (EBP) must be dependent on information Literacy (Shorten et al 2001; Barnard et al 2005; Pravikoff et al 2005;

Bernath and Jenkin 2006; Bailey et al 2007; Ross 2010); without the ability to know when and why evidence is required, how to identify, locate and critique it, EBP would appear to be difficult to achieve. However a review of the literature indicates that there is no convincing research evidence showing how IL manifests itself in the context of EBP. In fact there seems to be no picture of how the phenomenon of Information Literacy is experienced by nurses in clinical practice generally, and therefore educational initiatives by librarians are rarely evidence based (Brettle 2003).

It could be hypothesised that without a true understanding of the ways nurses' experience Information Literacy:

- There is no convincing way to show that the latter has a significant role or what that role is.
- There is also no way of verifying whether skills and knowledge developed in Information Literacy education programmes are actually relevant.
- There is no way to determine whether assessment tools are measuring anything of significance or value: is a nurse moving from a failure to experience the phenomenon or a partial experience of it to a complete experience?

A doctoral research project attempting to describe how Information Literacy is experienced in nursing practice, especially in the context of evidence-based practice, was begun in June 2011.

Selecting an Appropriate Methodology

Evidence-based practice in nursing can be seen as a constructivist process. Constructivism is the generation of knowledge and meaning from interactions

between an individual's experiences and their pre-existing ideas and understandings (Young, Paterson 2006). The individual experiences an environment (a clinical problem); part of that 'experience' includes the development of the awareness of a need for information – an inadequacy in knowledge and understanding of the clinical problem - and the identifying, locating and critiquing of that information, usually in the form of research evidence: that is, the experience of Information Literacy. This contributes to a new understanding of the clinical problem/ 'environment'.

Information Literacy forms a key part of this process (Barnard et al 2005), but Constructivism would seem to be inadequate to describe a nurse's experience of it. Whereas the clinical problem can be seen as separate from the nurse's experience of it in the accepted constructivist view, the latter's Information Literacy, it would appear, is not. Information Literacy – the experience of knowing when and why information is required, how to locate, critique, and use it - although contextually based is itself not the experience of an external phenomenon.

Although it may be true that Information Literacy itself is not an external phenomenon to the individual experiencing it, it is reasonable to suppose that each nurse will experience information literacy in many different clinical contexts and types of clinical contexts and potentially, therefore, in different ways (Marton 1988). And that each specific clinical context will produce different experiences for different nurses in the different ways each addresses, or is able to address, the 'information problem'. The increasingly adopted 'relationalist' approach to Information Literacy (Bruce 1997) is based on such an understanding: individuals are different and each experiences the phenomenon of IL in a range of ways depending on the context and their own experiences, understanding and knowledge.

It follows then, that a methodology which researches Information Literacy in Nursing must be sensitive to the varying contexts, both internal and external, in which a nurse experiences it.

One of the main motives for the study is an educational one. If the findings are to be used as a basis of educational interventions then they must be generalizable, so that a complete, structured picture of Information Literacy experience can be produced to which the student's own existing and future competence could be mapped.

So to investigate how Information Literacy is experienced by nurses, a methodology is required in which:

- Experiences are investigated subjectively: the individual and experience are not treated as wholly separate phenomena
- Experiences are investigated in a way which is sensitive to the variation in the contexts in which the phenomenon is experienced
- Experiences are investigated in a way which is sensitive to the variation in which different individuals experience the phenomenon in any one context
- Variations in experiences can be generalized so that a structured picture can be produced of the ways the phenomenon is experienced.

As reported by researchers who have made use of it (Bruce 1997; Andretta 2010; and others), Phenomenography is a methodology which can do all of this effectively.

Other possible candidates failed to fulfil some or all of these requirements, for example Phenomenology. Although also interested in subjective experience, Phenomenology attempts to determine the essential nature of the phenomenon through investigating a small number of individual experiences. It does not

differentiate between individual experiences or analyse the variations between them.
(Marton and Booth 1997)

Phenomenography

Phenomenography investigates the variations in the experiencing of a phenomenon in order to categorize those variations (in the form of 'categories of description') and set them in logical or otherwise meaningful relation with each other (Ashworth and Lucas 1998) in an 'outcome space': a diagram or similar representation of those relations.

It is a fundamental belief of Phenomenography that the experience of any phenomenon can be meaningfully categorized, and that the number of 'categories' are limited and determinable (Marton 1988; 1994). This hypothesis yields the possibility of seeing the 'outcome space' as an actual collective, comprehensive and accurate picture of the possible ways experiencing a phenomenon. This, in particular, fulfils the fourth, 'educational', requirement of the methodology described above.

Marton (1988) identified interviewing as the main method employed by phenomenographers. The use of audio-tape to record the interviews was common (Åkerlind 2005a; Aflague and Ferszt 2010; and others). This allowed accurate and complete transcriptions to be made; a key requirement for a sensitive and iterative analysis. It was also essential that questions should be as open ended as possible to allow the subject to express their 'relevance structure'. The interview should also be flexible in terms of direction and question order for the same purpose. There should

not be too many questions with too many details of the questions developed in advance. Questions should follow and be in the context of what the subject is saying and is currently describing.

Data Analysis in phenomenography

The literature indicates that there are two broadly defined 'schools' of data analysis method in phenomenography, with contrasting approaches. Any phenomenographic study must determine which method is appropriate to the study: its subject and context. A pilot study was set up to test both methods to determine the most appropriate for this study.

The two data analysis methods

The two methods differ in their attitudes to the interview transcript; one, following Marton (Marton 1986; Marton & Booth, 1997), reduces the collection of transcripts to 'utterances' or 'quotes', each with a perceived and distinct meaning, which are then brought together into categories on the basis of their similarities. Although part of the 'meaning' ascribed to an utterance comes from its context within a transcript, the transcript is no longer a data unit in itself. The second, the 'Åkerlind method', (Dall'Alba 1994; Bowden 1994; Prosser 1994; Åkerlind 2005a; 2005b), in contrast, treats the transcript as a key unit of data and one that retains its significance throughout the analysis. However, Åkerlind (2005a; 2005c) emphasises that both the emerging categories and the transcripts must be focussed on as a set and not as individuals to maintain focus on the collective experience - and the eventual outcome space. The individual transcript is not equivalent to a category of

description. (also Bruce 1997). 'The meaning of the phenomenon for any one participant may vary under different circumstances' (Åkerlind 2005c p.81).

While those who followed the Marton approach agreed on the importance of considering the larger context when interpreting and selecting excerpts from the transcripts, working with whole transcripts (despite Åkerlind's stated awareness of the issue) is seen as having the danger of encouraging an analytic focus on the individual interviewee, rather than the group of participants as a collective. Also, taking a whole transcript approach to analysis may reduce the clarity of the key aspects of meaning, because the meaning a phenomenon holds for an individual may vary during the course of an interview.

However, a major disadvantage of the Marton method would appear to be the risk of 'cherry-picking' of what seems to be relevant or important to the researcher and abandoning what doesn't – this results in great risks that the participant's life-world will be lost under that of the researcher's.

Åkerlind (2005b) described in detail her transcript-centred approach. The first stage involves reading though each transcript three times, on the third reading making notes on each, summarising key 'issues and themes' emerging in the context of the others. The second stage involves grouping 'similar' transcripts together after re-reading both the transcripts and the notes over and over. The third stage involves re-arranging the groups after further readings, which focus both on searching for similarities and differences in the overall meaning in the transcripts and alternately searching for 'dimensions of variation in meaning that ran across the transcripts....by looking for *themes of expanding awareness* running throughout the set of transcripts

as a whole, where each theme linked a set of different dimensions of variation' (p.121). That is both the 'dimensions of variation' or emerging Categories of Description, and the beginnings of the connective structure of the Outcome Space. Åkerlind emphasises that a 'theme' required both 'logical' standing and 'empirical' evidence.

Åkerlind (2005a) underlines the importance of categories of description not being decided in advance but being allowed to emerge from the data. For Marton (1986) a primary feature of categories of description is the qualitative similarities and differences from each other. Without these links they have no value.

The Pilot Study

Åkerlind (2005b) strongly recommends pilot studies to iron out problems in interview protocol content, interview technique and methodological issues. As described above this pilot study was particularly concerned with evaluation of the Åkerlind and Marton analysis methods in order to determine their relative appropriateness.

Ashworth and Lucas (2000)'s guidelines were used as a general basis of approach for the study.

Using the Marton Method

Marton (Marton 1986; Marton & Booth, 1997) did not use the transcript as an entity in the data analysis process. The transcripts are immediately reduced to a number of 'utterances' or 'quotes', each with a specific meaning (partly, at least, from its context

within the transcript), which are resolved into categories on the basis of their similarities.

As described above, Marton's approach is based on the perceived danger of an analytic focus on the individual interviewee rather than the group of participants as a collective.

However, the danger of the interviewer losing the significance of an apparently meaningless utterance when taken out of the context of the interview – an utterance which may, when seen in that context be significant in the description of a life-world would need to be evaluated carefully.

Aflague and Ferszt (2010 p.250) interpretation of Marton's 'seven steps' of analysis was used.

Familiarization - Once the audiotapes are transcribed, the transcripts are read a number of times while listening to the audio tape.

Condensation - The most significant statements are given a short but representative version of the complete dialogue concerning the phenomena of interest.

This proved difficult to do as the concept may have developed over several sentences and built on something earlier in the transcript. What turned out to be a 'significant' only became so when associated with other statements elsewhere and usually had little 'independent life' of its own.

Comparison - The selected significant dialogue excerpts are compared in order to find sources of variation or agreement.

Difficulties in finding meaningful 'statements' led to difficulties in comparison and contrast. Similar difficulties occurred in the following three stages.

Grouping - Answers that appear to be similar are put together.

Articulating - A preliminary attempt is made to describe the essence of the similarity within each group of answers. Grouping and Articulating may be repeated several times.

The inability of simple phrases to properly represent what were turning out to be complex experiences, resulted in great difficulties in grouping them meaningfully...

Labelling - The various categories are denoted by constructing a suitable linguistic expression.

...and forming meaningful categories.

Contrasting - The obtained categories are compared with regard to similarities and differences

On the whole the Marton method was not found to be conducive to the identification of those 'themes' which are the embryonic categories of description. The early divorce of the 'significant statement' from the context seemed to prevent the development of meaningful expressions of experience. Expressions of experience in this study seemed to be complex, and involve statements which interacted with each other from throughout the transcript.

Using the Åkerlind Method

The alternative method of data analysis (Dall'Alba 1994; Bowden 1994; Prosser 1994; Åkerlind 2005a; 2005b), in contrast, treats the transcript as a key unit of data throughout the data analysis process. However Åkerlind (2005a; 2005c) emphasises

that that both the emerging categories and the transcripts must be focussed on as a set and not as individuals to maintain focus on the collective experience - and the eventual outcome space. The individual transcript is not equivalent to a category of description as each participant may report different experiences of the phenomenon in terms of perspective and complexity.

Åkerlind's (2005b) protocol was used:

1. Read though each transcript three times, on the third reading making notes on each, summarising key 'issues and themes' emerging in the context of the others.

The transcripts were read in sequence and this process was then repeated twice. It is instinctive to want to begin making notes immediately; however the value of reading the transcripts twice before doing so was clear when the significance of individual statements, as claimed in Åkerlind method, was seen in clearer, or different, focus with a knowledge of the whole transcript. The discussion of the relationship between the two phenomena (IL and EBP) seemed to result in an interview in which the participant needed to 'come back around again' to further develop the description of an experience which also involved bringing together widely 'located' previous comments.

2. Group 'similar' transcripts together after re-reading both the transcripts and the notes over and over.

This was difficult with such a small number of transcripts, but overall 'themes' did begin to emerge.

3. Re-arrange groups after further readings focussing on

a. searching for similarities and differences in the overall meaning in the transcript

Not something which could be done meaningfully with this number of transcripts yet contrasts between transcripts in approaches to EBP and IL were clear. As these approaches did seem to relate to the range and nature of experiences given in the transcript, the value of this process as a preliminary sorting activity began to show itself.

b. searching for 'dimensions of variation' in meaning that ran across the transcripts

These would be developed into categories of description in due course. The second reading was a process of underlining key statements with different coloured pencils so that links to other apparently related statements elsewhere in the transcript could be made. The third reading involved the attempt to 'coalesce' these related statements into 'dimensions of variation'.

c. looking for themes of expanding awareness running throughout the set of transcripts as a whole, where each theme linked a set of different 'dimensions of variation'

Very difficult in a small pilot study. These themes are the structures of relation between the categories and the beginnings of the 'Outcome Space'.

Summary

It became clear that the relationship between information literacy and evidence-based practice that seemed to be emerging was a complex one. The ideas expressed seldom took the form of simple phrases or sentences but emerged with the comparison and accumulation of statements made over a complete interview. The Åkerlind method, unlike the Marton method, allowed for this complexity. Correspondingly complex categories of description could be formed by reading

across many parts of a transcript as well as across transcripts. The wide-ranging context of many statements within an interview and the complexity of categories of description that emerged, with their elements of EBP theory and practice, made it essential that short statements were not divorced from the whole interview too early. It was difficult to see how the comparatively complex draft categories of description could have been evolved through the Marton method.

Phenomenography's strengths are clear – its ability to develop logical structures which give a picture of the experience of a phenomenon, while having the ability to read into the structure as much of the complexity of that experience as is consciously and practically possible. In studies which involve experiencing nursing's complex relationship to other phenomena, the 'Åkerlind method' of data analysis would seem to provide the most appropriate tool to make sure that this complexity and its parameters are properly uncovered and described.

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