PHENOMENOGRAPHY AS A WAY TO RESEARCH THE UNDERSTANDING BY
STUDENTS OF TECHNICAL CONCEPTS

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The understanding of technical concepts by students is often raised as an area of concern by academics using for the most part anecdotal evidence to support their claims. This paper outlines a research approach called phenomenography that can be used to investigate the range of different ways that students experience technical concepts, or in fact, various aspects of learning in general. Phenomenography is a research approach that takes a non-dualist, second-order perspective describing the key aspects of the variation of individuals’ experience of a phenomenon. The results of a phenomenographic analysis are a hierarchical set of categories of description describing the variation in the way a phenomenon is experienced. Embracing a methodology like phenomenography will mean that academics no longer need to draw on anecdotal evidence to be support their discussions around pedagogic issues and the results can directly inform their teaching practice.

INTRODUCTION

The understanding of technical concepts by students is often raised as an area of concern by academics using for the most part anecdotal evidence to support their claims. This paper outlines a research approach called phenomenography that can be used to investigate the range of different ways that students experience technical concepts, or in fact, various aspects of learning in general.

In order to answer questions such as how students understand technical concepts, it is necessary to adopt a theoretical perspective that has understanding as a central research outcome and thus a particular view of the generation of knowledge is required. We are not looking for causality or laws that govern behavior but rather, we look to understand these issues in terms of the people that make up the world – the students in this instance. The objectivist (or positivist) approach of the former places emphasis on what researchers observe. In this approach, reality exists ‘out there’ waiting to be revealed and all that is required is ‘good science’ and the laws required for prediction will be discovered. With this approach, researchers are not able to address questions that study meaningful social action or seek to understand the social nature of people. In looking to understand these issues in terms of the people that make up the world, it is the meaning derived through interpretation that is important. This meaning comes about through our interaction with the realities in our world and is constructed, not discovered.

Research into the understanding of technical concepts by students is most meaningful if you specifically look to understand students’ interactions with these issues through their eyes, or rather, from their perspective. Research of this nature is referred to as second-order research (Marton, 1981). Here a researcher explores the relationship between a student and an aspect of the world (technical concepts) as it is experienced by that student. In other words, the researcher is not making statements about a phenomenon, but rather about students’ ideas of that phenomenon. This is different from the traditional first-order perspective where a researcher studies a phenomenon directly – research in the natural sciences is generally of this type where a researcher tries to describe things as they are. This first-order approach would be typical of an objectivist (or positivist) stance.

Phenomenography is a research approach that has at its core these characteristics and is ideal to investigate issues such as students’ understanding of technical concepts. A comprehensive description of the phenomenographic approach is presented below.

PHENOMENOGRAPHY AS A RESEARCH APPROACH

Phenomenography developed from the work undertaken by Marton, Saljo, Dahlgren, and Svensson in the mid-1970’s at the University of Gothenburg in Sweden amongst university students on what it takes to learn. In this research, Marton, et al. moved from studying learning from a quasi-cognitive-psychological framing to studying the experience of learning. This was a marked departure at the time from the classical approach to investigating learning. The outcome of this research was that Marton, et al. could describe the qualitatively different ways that students experienced learning. This result was possible because they were no longer looking at the individual as central to their research, but rather the students they investigated were a collective supplier of fragments for how learning was experienced. Marton has described phenomenography as follows:

Phenomenography is a research method adapted for mapping the qualitatively different ways in which people experience, conceptualise, perceive, and understand various aspects of the world around them. … [P]henomenography investigates the qualitatively different ways in which people experience or think about various phenomena. (Marton, 1986, p.31)

Phenomenography as a research approach developed from strongly empirical roots (Hasselgren e Beach, 1997). As the approach became more widely used, a greater emphasis was placed on making explicit its theoretical underpinnings. Marton, in his seminal paper on phenomenography (Marton, 1981) and two other publications (Johansson, Marton et al., 1985; Marton, 1986) laid much of the early foundations for the ontological and epistemological basis of phenomenography. During 1991, the Warburton Symposium was held to discuss the variations in method used in phenomenographic research up to that time. Arising from this symposium, a monograph (Bowden e Walsh, 1994, 2000) was published which critically interrogated issues in phenomenography and included critiques of aspects of the approach that need addressing. From 1993 to 1995, the journal Nordisk Pedagogik published a series of articles under the theme ‘Reflections on phenomenography’ that dealt in depth with the ongoing debate around methodological issues. These were subsequently republished Reflections on phenomenography – Toward a methodology? (Dall’alba e Hasselgren, 1996). In the late 1990’s, Marton and Booth published what has become one of the most widely cited phenomenographic texts, Learning and Awareness (Marton e Booth, 1997) where they present phenomenography in terms of a structure of awareness. Also in 1997, a special issue of Higher Education Research and Development (HERD) focussing on phenomenography was published. More recently, Bowden and Green have published Doing Developmental Phenomenography (2005), an updated look at many of the methodological issues raised before. Each of these publications has advanced the epistemological and ontological position of phenomenography as a research approach.

The result of the critical debate around phenomenography in the publications above was to advance the theoretical basis of the approach. Central to phenomenography is that it takes a non-dualist, second-order perspective. It aims to describe the key aspects of the variation of the experience of a phenomenon rather than focus on the richness of individual experiences. Figure 1 (Trigwell, 2000b) shows these key aspects of phenomenography in relation to a number of other research approaches that investigate human experience. The results of a phenomenographic analysis are a limited number of internally and logically related, qualitatively different, hierarchical categories of description of the variation in the way a phenomenon is experienced. This description of the phenomenographic approach will form the point of departure for a detailed discussion of phenomenography to follow. My aim is to show the characteristics making phenomenography ideal for answering questions such as, for example, how students understand technical concepts.

![Figure 1 - Phenomenography in relation to other research approaches that investigate human experience (Trigwell, 2000b)](image)

**The importance of a non-dualist ontology and second-order perspective**

In the description of phenomenography presented above, the central premise was that it takes a non-dualist, second-order position. Säljö (1997) defines a non-dualist stance as a position where ‘the internal (thinking) and the external (the world out there) are not posited as isolated entities’ (p.173). For phenomenography to develop from a fundamentally non-dualist ontology implies that meaning stems from the relationship between an individual and a phenomenon, or rather, the relationship between a subject and an object. The subject and object of an experience are not separate and an individual’s experience of a phenomenon is the internal relationship between them. It is this relational view that forms a cornerstone of phenomenography. Marton (2000) has argued that:
From a non-dualistic ontological perspective, there are not two worlds: a real, objective world, on the one hand, and a subjective world of mental representations on the other. There is only one world, a really existing world, which is experienced and understood in different ways by human beings. It is simultaneously objective and subjective. An experience is a relationship between object and subject, encompassing both. (p.105)

I suggested earlier that there are a number of research approaches that take a non-dualist ontological position. However, they tend to interpret and derive meaning in the action of others by studying this action directly. Phenomenography takes an alternative position and looks to understand individuals’ interactions with the world through their eyes, or rather, as I described above, from their perspective. This is the second-order view of the development of knowledge where a researcher is not making statements about a phenomenon directly, but rather about individuals’ ideas of that phenomenon. Furthermore, the phenomenon can be thought of in terms of the ‘complex’ of the distinctly different ways in which it can be experienced.

The object of phenomenographic research

Phenomenography looks to describe the significant, or critical, features of the different ways individuals experience a phenomenon. The term ‘conception’ is often used to refer to individuals’ ways of experiencing a specific aspect of reality and according to Sandberg (1997, p.130), the idea of phenomenography is to describe individuals’ conceptions as faithfully as possible. Thus, conceptions can be thought of as making up the *unit of analysis* in phenomenography and refer to ‘whole quantities of human-world relations’ (Johansson, Marton et al., 1985, p.249). However, conceptions are not visible ‘but remain tacit, implicit, or assumed’ (ibid, p.236).

How then can phenomenography have conceptions as the object of research if they cannot be studied directly? Conceptions are typically represented or characterised in the form of categories of description or as Säljö (1996, p.25) suggests, ‘categories of description are intended for describing conceptions’. These categories of description are the nominal outcome of a phenomenographic analysis. However, it must be stressed that categories of description are not synonymous with conceptions (Bowden, 1996; Sandberg, 1997). Rather categories of description should be thought of as ‘denoting’ conceptions.

Säljö (1996, p.28) has argued that phenomenography implies the decontextualisation of ‘conceptions’ via ‘categories of descriptions’ into ‘outcome spaces’, with an outcome space a hierarchically ordered set of categories of description. The interrelationship between these ideas is discussed below.

The outcome of a phenomenographic analysis

Phenomenographic research has as its outcome a set of categories that describe the variation in the way a phenomenon is experienced. This ‘complex’ of categories of description form what is referred to as an outcome space (or space of variation) that contains distinct groupings of aspects of a phenomenon. Central to this outcome space is that the categories will be logically related, typically hierarchical in nature, with each successive category being a more complex way of experiencing the phenomenon under investigation. The nature of the categories are important and Marton and Booth (1996, p.125) indicate that categories of description need to fulfil three criteria for them to be phenomenographic. The first is the requirement for the categories to be logically related. The other requirements are that they be parsimonious, i.e. the minimum number of categories that fully describe the variation in the ways of experiencing the phenomenon must be used. Finally, each category must completely describe a distinctly different aspect of the experience of a phenomenon, i.e. each category of description must be qualitatively different from the others.

Categories of description have been shown in many studies of many different phenomena to be limited in number with respect to a particular phenomenon (Trigwell, 2000a, p.76). In other words, for any phenomenon, there are a limited number of qualitatively different ways that this phenomenon can be experienced. Furthermore, it is not enough simply to determine a set of qualitatively different categories to have a phenomenographic result. In fact, it is not so much the categories *per se* that are important, but rather the differences and similarities that serve to link and differentiate one category from another, i.e. the structure and meaning related to the categories.

Bringing structure and meaning to an experience

In describing an experience through a set of categories of description, it is possible to describe the structure of the experience as well as the meaning of the experience. This follows from the fact that in order to experience a phenomenon as a phenomenon (i.e. its *structure*) it is important that a person discerns this phenomenon from its environment *and* is focally aware of the relevant aspects simultaneously. To give it *meaning*, it is important that this phenomena be seen in the context of the situation in which it is found. It should be apparent from this discussion that structure and meaning are intertwined as one, or as Marton and Booth (1997) suggest, ‘The two
aspects, meaning and structure, are dialectically intertwined and occur simultaneously when we experience something’ (p.87). However, it is possible for a researcher to separate them analytically to be able to describe fully the experience. This separation manifests itself by supplying a *structural* aspect and a *referential* (meaning) aspect to categories of description within an outcome space. More specifically then, the structural aspect is the discernment of the whole of what is being focussed on from the context in which it is located as well as the discernment of the parts and the relationship between these parts in the whole. The referential aspect brings meaning to the experience by focussing on the form of the structure and the context in which it is situated.

With reference to the structure of the experience of a phenomenon, it is also possible to further describe this in terms of an internal and external horizon. These relate to the inter-relationship between ‘parts’ that make up the phenomenon in the case of the internal horizon, and the relationship of these ‘parts’ to the context in the case of the external horizon. The example of coming across a motorcar engine on a scrap heap serves to illustrate the interrelationship between these ideas. The external horizon of seeing the engine in the scrap-yard extends from the immediate boundary of the experience (the engine sitting amongst the pile of scrap) through all other contexts where engines have been encountered before that moment. Marton (1994, p.4426) refers to this external horizon as the ‘delimitation [of the object] from [the context] and relating [it] to a[n expanded] context’. The internal horizon consists of the engine itself: its shape, parts, configuration, etc. In the words of Marton and Booth (1997, p.87), it has a “structural presence”.

**The structure of awareness**

The internal and external horizons discussed above are related to what has been constituted as a structure of awareness (Booth, 1992; Marton e Booth, 1997). Within this structure of awareness, the internal horizon consists of the parts of a phenomenon (and their relationship with each other) that are in focus. The external horizon is everything that surrounds the phenomenon, including its context (the limit of its extents).

In order to develop this idea of there being structure to the awareness of an experience, it is necessary to describe how a person is aware of a particular situation they may find themselves in. It is possible to be simultaneously aware of many things, but not necessarily all in the same way. Some things are focussed on (i.e., they are figural, or central) and some things are relegated to the very limits of awareness (i.e., they recede to ground). When focussing on a phenomenon, all the aspects that are simultaneously in mind, based on the situation, are referred to as being part of a thematic field. While focussing on this phenomenon, there will be aspects that you will not focus on as fully as they are not directly related to the phenomenon. These non-related aspects are moved to the margin of awareness. Within the thematic field, some aspects will come to the fore and become central to ones focus of awareness. These are referred to as the theme of awareness (Marton e Booth, 1997, p.98). Figure 2 shows how it is possible to illustrate graphically these regions of the structure of awareness. It is important to note that these are not three distinct (or delineated) areas as they may appear in the figure. They should be thought of as forming part of a continuum, an ‘infinitely differentiated figure-ground structure’ (Marton, 1994, p.4427).

![Figure 2 - The structure of awareness (after Booth, 1992)](image)

The concepts described above are best illustrated by means of an example. Imagine a beauty pageant after the semi-finalists have been announced and they are standing apart from the rest of the contestants towards the front of the stage. At this moment, the audience is focussing on the semi-finalists collectively; their clothes, hair, shoes, etc. They make up the thematic field with the unsuccessful contestants now relegated to the margin. As soon as the winner is announced from within the group, the audience’s focus shifts to this individual – the winner, and *their* characteristics, become central to the audience’s awareness. Thus, within the thematic field, these aspects make up the theme of awareness – the audience is still aware of the other semi-finalists, but in a limited way.
ISSUES OF DATA COLLECTION

The methodological underpinning of phenomenography posits that the data collected be a person’s experience of a phenomenon as described by that person. What then makes a particular method appropriate as part of a phenomenographic research approach? It is one that has a data collection strategy that facilitates a person reflecting on their experience of a phenomenon. Marton and Booth (1997, p.129) have spoken of people being required to reflect over their experience of a phenomenon in a state of ‘meta-awareness’. This form of reflection is not necessarily something that happens spontaneously, but enabling it is the key to an appropriate method of data collection. According to Marton (1994), ‘The more it is possible to make things which are unthematised and implicit into objects of reflection, and hence thematised and explicit, the more fully can awareness be explored’ (p.4427).

A typical phenomenographic study would first have people perform a task or engage in some activity. In the context of this paper, this could be where technical concepts are experienced by students. Thereafter they would report on it and describe how they had gone about this task or activity. Marton and Booth (1997) describe how initially, ‘the phenomenon that the [person] is being asked to handle is … brought to awareness by the interviewer in an open and concrete form. [Thereafter, the person] herself has to discern the phenomenon and distinguish it from the situation as a whole’ (p.130). They add that in the first part, ‘the phenomenon is anchored in the interview situation, whereas in the second, … it transcends the situation’ (ibid). It is helping learners to reach this state of meta-awareness that needs to be central to a phenomenographic data collection strategy.

An analysis of published phenomenographic studies shows that data are collected in predominantly two ways. Data collection is either through an interview or through the text written by the person in response to a specific question. Other methods have been used, such as reviewing film footage of one-year-old toddlers’ experience of their first three months in nursery school, but are less common. As the interview is the most common method of data collection, this approach will form the focus of the discussion to follow.

The nature of the phenomenographic interview

As I argued above, the key to the phenomenographic interview is to enable a person to reflect over their experience of a phenomenon. The interview should allow aspects of the person’s experience of a phenomenon to be thematised where it may, without the interview, not have been. Critical to achieving this is the researcher and interviewee establishing a ‘shared definition’ (Bowden, 1996, p.58) of the phenomenon under discussion. It should be recognised that the experiences captured by the interview are ‘jointly constituted by the interviewer and the interviewee’ (Marton, 1994, p.4427) and are thematised through a ‘conversation between two partners about a theme of mutual interest’ (Kvale, 1996, p.125). Säljö (1996, p.23) has referred to this ‘theme’ as a shared topic of discourse. In this case, technical concepts could constitute the theme.

The typical phenomenographic interview is of a semi-structured nature with only a few key questions predetermined. This is in contrast to the archetypal qualitative interview where a detailed framework of the interview is developed beforehand. That is not to say that the phenomenographic interview is without focus. The object of study (as described earlier) is held central to the interviewer’s focus at all times and guides the interview situation. The majority of the interview is thus centred around following up and exploring different aspects of the interviewee’s experience as thoroughly as possible. The process of continuous probing and directed following up of comments makes the phenomenographic interview by nature more intimidating than a traditional qualitative interview. In this vein, Francis (1996) has warned that care must be taken to ‘treat the interviewee as a reporting subject rather than an interrogated object’ (p.38).

The importance of context in a phenomenographic interview

As phenomenography has developed as a research approach, the phenomenographic interview as a legitimate way of exploring a person’s experience of a phenomenon has been one aspect that has been the target of critique, no more so than by Säljö (1996; 1997). Central to Säljö’s concern is the ‘relationship between discourse and experience’ (1997, p.174) and the issues that arise from his belief that the phenomenographic interview is in essence simply a social construction. He cautions that researchers need to be careful about what they decide a conversation is indicative of especially considering the weight phenomenographers place on the interview conversation. Säljö suggests that phenomenographers do not recognise the ‘primacy of talk’ (Säljö, 1996, p.20) in an interview situation.

The example Säljö uses to illustrate his position relates to an interview he undertook with a student about a physics problem. The student had ‘no difficulties in presenting the expected and authorised kinds of reasoning in spite of the complexities of the problems involved’ (ibid). A chance question from Säljö asking if she understood what they had been discussing resulted in the reply, ‘No, I don’t understand it at all, but this is the way they talk around here and then I do that too’ (ibid). A response of this nature to an interview question provides cause for
concern given the importance that phenomenographic researchers place on data collected during an interview. This is especially relevant considering that a phenomenographic analysis is performed without access to anything ‘except utterances from individuals made in specific situations and with varying motives’ (Säljö, 1997, p.177).

Säljö continues his argument by referring to the asymmetric power situation often found in an interview situation (Kvale, 1996, p.126) and arguing that utterances in a interview could quite conceivable signify something other than indicated by what is said. For example, these utterances could be an attempt to ‘fulfil one’s communicative obligations’ on being asked a question, or simply the result of not wanting to ‘lose face’ when being asked a challenging, or possibly abstract, question (Säljö, 1997, p.177). In short, he cautions against simply accepting an interview conversation ‘as indicating a way of experiencing rather than as, for instance, a way of talking’ (ibid, p.178).

These critiques of the phenomenographic interview can be addressed by ensuring that ‘context’ as a necessary element of a phenomenographic study is kept in mind during implementation of the research approach. Both Marton (1996) and Säljö (1997) indicate that the early phenomenographic studies placed participants in situations with a meaningful context and that there was thus something ‘meaningful for the interviewer and interviewee to explore together’ (Marton, 1996, p.171). The importance is thus stressed of creating a shared experience for the participants in the phenomenographic study to reflect on during an interview. Säljö (1997) argues further that phenomenographic results ‘become interesting’ when there is a ‘discursive practice in which people are trying to achieve something … rather than when they are being asked abstract questions in interview situations on almost any topic’ (p.179).

**Characteristics of the sample**

A critical question relating to phenomenographic studies is who to interview about their experiences of a phenomenon. The key to answering this question is to recognise that the outcome of a phenomenographic analysis is the variation in the ways of experiencing a phenomenon. The focus is on variation and purposive sampling is a technique that allows ‘critical cases’ (Cohen, Manion et al., 2000, p.103) to be selected based on the judgement of the researcher. Including these critical cases in the purposively selected sample will thus give the best opportunity of manifesting the full extent of the various ways of experiencing the phenomenon. In determining the individuals most likely to provide this variation in ways of experiencing, consideration is not necessarily given to being inclusive of gender or particular cultural groups as may be central to many other methods. A researcher applies his/her mind to selecting critical cases without regard to what are, in a phenomenographic sense, artificial distinctions.

A further issue relating the characteristics of the phenomenographic sample is how many people to interview about their experience of a particular phenomenon. In traditional qualitative research, the idea of ‘theoretical saturation’ proposed by Glaser and Strauss (1967) is often used. Theoretical saturation occurs when ‘no additional data are being found … [and] the researcher becomes empirically confident that a category is saturated’ (p.65). This technique is not necessarily appropriate in a phenomenographic study primarily because we are looking to understand individuals’ interactions with phenomena from their perspective. Phenomenographic data analysis does not entail ‘keeping score’ of fragments of experiences as they are placed in predetermined categories as may be the case in content analysis. Before a phenomenographic analysis takes place, there is no way of knowing the extent of the variation that has been captured during the interviews. Trigwell (2000a, p.66) argues that between fifteen and twenty people is the ideal number to interview. He continues that ‘ten to fifteen would be the minimum to create a reasonable chance of finding variation in the range’ (ibid). Dahlgren (1995, as cited in Åkerlind, 2003, p.54) suggests that as long as the sample is selected to maximise variation, ten interviews in normally enough to capture the variation.

An aspect of a phenomenographic analysis, which has been criticised by some, is that it is possible for only a single interview to contribute to the constitution of a category of description. The process of how this is possible will be dealt with in the next section, but the important question to be addressed here is what would have happened had this individual not been amongst those interviewed. The answer to this involves a number of issues. I argued earlier that the content of an interview is a conversation constituted between the researcher and the person being interviewed. During the interview, the interviewee’s description of their experience of a phenomenon is not necessarily constant throughout the interview. It may vary, and possibly even change, as aspects are brought into focus and become figural (and others move to ground) during the interview conversation. As a result, even though a particular person is one of those interviewed, there is no guarantee that during the conversation they will express what may turn out to singularly constitute a category of description. Similarly, any other person interviewed could potentially at any time help to constitute the same category. The process of developing categories of description involves looking at fragments of an interview in the context of
that interview as well as in the context of all the other fragments from all the other interviews. Just because it appears as though a category may have been constituted by an individual, this is not so. It is constituted in terms of the relationship between that experience of the phenomenon in the context of all the other experiences of that phenomenon. The best chance of ensuring the complete variation of the ways of experiencing a phenomenon remains to sensibly select the participants in the study to ensure as much variation as possible. It is the collective experience of the participants that is analysed. An individual is simply a contributor to this collective.

PHENOMENOGRAPHIC DATA ANALYSIS

The following section will describe the analytical process followed to develop the ‘hierarchically related, critically different set of categories of description’ that I indicated earlier are the outcome of a phenomenographic analysis. Although phenomenographers may use a number of different methods of analysis (Bowden & Walsh, 2000; Walsh, 2000), they share the same underlying philosophy. Researchers (cf. Åkerlind, 2002) have gone as far as to compare the various approaches leading researchers have used to perform their phenomenographic analyses. The following is not necessarily a summery presentation of these different approaches, but rather an argument for one approach that can be adopted.

From interview to transcript

Once the series of interviews for a project (the nature of which were discussed above) are complete, the researcher transcribes the conversations that took place. One of the first decisions required of the researcher is to specify how accurate a transcription is necessary as that act of transcription is itself an ‘interpretive process’ (Kvale, 1996, p.160). I would argue that since a phenomenographic analysis does not have the same focus on linguistic elements as a method such as discourse analysis, it is not necessary to record every tonal inflection or pause in speech. What is important is that the ‘spoken word’ is transcribed as accurately as possible as it forms the basis for the analysis to follow. Thus, with due recognition given to Kvale’s (ibid, p.165) concerns that the oral language of an interview is decontextualised into the written word, the transcripts need to accurately capture how a person has reflected over their experience of a phenomenon during the interview.

I discussed earlier how phenomenography is a research approach with not only methodological issues but also with requirements as to method of data collection and analysis. Once a researcher has a set of interview transcripts in front of him/her, it becomes necessary to draw on the aspects of phenomenography that talk to process of analysis.

Fragments of conceptions?

After the interview conversations have been transcribed, there is a difference in method amongst researchers about what the next step entails. In the classic formulation of the phenomenographic method, Marton (1986; 1994) suggests first selecting from the transcripts those sections where the interviewees have focussed on reflecting over their experience of the phenomenon in question. The next step is literally to cut out excerpts that relate to the experience of the same phenomenon and place these in a pile on a table in what he refers to as a ‘pool of meaning’ (Marton, 1994, p.4428). This pool of meaning is essentially a decontextualised collection of fragments from all the interviews that refer to an experience of the phenomenon in question. This pool of meaning forms the starting point for further analysis. Prosser (2000) takes a different view and indicates that he deals with transcripts as a whole. However, he argues that the only workable course of action for dealing with the process of analysis is to divide the transcripts into what he calls ‘related parts’ (ibid, p.45) and then analyse these parts in relation to each other and in relation to the categories constituted. In this approach, there is no pool of meaning in the Martonian sense, but rather a set of sections of interview – each still firmly located within the context of the interview from which it originated. Bowden (2000) on the other hand ‘prefer[s] to deal with the whole transcript all of the time’ (p.12). He looks at ‘any particular utterance’ (ibid) in the context of what was said in the interview as a whole and argues that placing excerpts in and working from a pool of meaning runs the risk of complete decontextualisation from the original transcript. However, Marton (1994) counters this argument by specifically stating the requirement during analysis to ‘make sense of particular expressions in terms of the collective as well as of the individual context’ (p.4428). Even so, this is one area where care during analysis of data in the pool of meaning is required to ensure that the relevant contexts from which the excerpts come are held in the researchers focus. However, even those researchers who deal with interviews as a whole concede that it is difficult to hold 20 interviews in their head simultaneously (Trigwell, 2000a, p.66) during analysis.

Interestingly, it would appear that these two contrasting approaches to dealing with interview transcripts align with geographical boundaries. An analysis of the work of Swedish phenomenographic researchers reveals that favour is given to the pool of meaning approach. Australian phenomenographers on the other hand generally tend to follow the ‘whole transcript’ approach. There are of course exceptions to this generalisation, but largely
this pattern appears to hold. As I have been influenced by the Swedish school this could be partly why I favour the Martonian approach. However, one of the central reasons I adopt this approach is the way it deals with changing meanings of the experience of a phenomenon expressed during an interview conversation.

During an interview, the researcher jointly constructs the conversation with the interviewee and guides the interview keeping the object of research in mind at all times. The interviewee’s reflection on their experience of the phenomenon in question can (and often does) change as various aspects are brought into focus and others recede to ground. This scenario complicates considering an interview as a whole as this approach has difficulty dealing with the different expression of experience of a phenomenon. The process of selecting excerpts from transcripts relating to specific phenomena, and considering these together, largely overcomes this issue. From a purely pragmatic perspective, Svennson and Theman (1983, as cited in Åkerlind, 2003, p.62) argue that selecting excerpts that seem to ‘exemplify meanings’ present in the larger interview, while removing ‘perceived irrelevant or redundant components’ of the interview, should also assist in making the data more manageable.

**Construction or discovery as the process of analysis**

I argued above for placing excerpts from each transcript that relates to an experience of the same phenomenon in a pool of meaning. The next step in the phenomenographic analysis is to develop the limited number of internally and logically related, qualitatively different, hierarchical categories of description of the variation in the way a phenomenon is experienced. Walsh (2000) has argued that this process of analysis can be seen as either a construction of the categories or as a process of discovery of the categories. The understanding here is that in the case of ‘discovery’, the categories of description are already ‘present in, and constitutive of’ (p.20) the data and the process of analysis is to let these categories emerge as the analysis progresses. In the case of ‘construction’, the categories of description ‘emerge from the relationship between the data and the researcher’ (ibid). I would argue that to view the constitution of categories of analysis as taking place purely through ‘construction’ is problematic as this introduces the possibility that the researcher can impose their own framework onto the data or introduce their own pre-conceived ideas about the phenomenon into the categories. To focus on the ‘discovery’ of categories is potentially problematic as the assumption is made that the categories are independent of the researcher’s method of analysis (ibid, p.23). In this ‘discovery’ approach, emphasis is placed on the similarities and differences that exist in the data. Through the process of ‘discovery’ (Hasselgren e Beach, 1997), a category is developed by focussing on the similarity in the data constituting the category while differences between categories emerge through focussing on the differences between data. Bruce (1997) argues that aspects of both these views are appropriate in the constitution of categories of description:

> In the same way that we see conceptions as being constituted in the relation between perceiving subject and appearing object (both are active in constituting the conception); so we may see categories of description as being constituted in the relation between researchers and the data (both are active in constituting the categories). Analysis is a process of discovery because the conceptions reveal themselves through the data, and it is a process of construction because the researcher must identify and describe these in terms of referential and structural elements. (p.103)

Phenomenography has no prescribed method for how researchers make these categories of description emerge through a process of construction and discovery from the data. However, there are a number of common aspects in the approach taken for the analysis of data.

**Constituting an outcome space**

The process of constituting categories of description in a phenomenographic analysis differs from a typical content analysis approach (or as Prosser (2000, p.45) terms it, the ‘shopping basket’ approach) where categories are determined in advance and interview extracts are classified based on these categories. A phenomenographic analysis is quite different. This difference is primarily because, in the analysis, the way in which an individual experiences a phenomenon is only part of the way that phenomenon can be experienced and the categories of description represent the variation in all the different ways of experiencing the phenomenon. By predetermining these categories of description, the analysis runs counter to the second-order nature of phenomenography and ends up simply being a researcher’s construction of the ways of experiencing a phenomenon – something akin to a phenomenological study.

The first step in the process towards constituting an outcome space is to populate the pool of meaning with the decontextualised collection of fragments from all the interviews that refer to an experience of the phenomenon in question. This is achieved by carefully reading the transcripts and looking for meaning units in the text that relate to this phenomenon. These sections of text could be a single answer to a question or part of a longer conversation. The key here is that the interviewee should be focussing on a single aspect of the phenomenon for the duration of the meaning unit of text. Once the individual meaning units have been identified across all the
interviews, the interviews are deconstructed and only the individual meaning units retained. This is done by literally taking a pair of scissors and cutting out the appropriate sections of text and discarding the irrelevant text. These meaning units are ‘placed’ in the pool of meaning that then contains all the possible ways of experiencing the phenomenon in question. The individuals interviewed have thus provided fragments of the ways of experiencing the phenomenon to this pool and the assumption is that this, at a collective level, would represent the variation in ways in which this phenomenon is experienced. The data is thus homogenised by removing unimportant differences such as the terminology used during the interviews and the integration and generalisation of important similarities (Dahlgren, 1997).

Once the pool of meaning is populated with ‘meaning units of experience’, Marton (1986) has described in detail a process for the next stage in the constitution of the categories of description:

The selected quotes make up the data pool which forms the basis for the next and crucial step in the analysis. The researcher’s attention has now shifted from the individual subjects (i.e., from the interviews from which the quotes were abstracted) to the meaning embedded [in] the quotes themselves. The boundaries separating individuals are abandoned and interest is focused on the “pool of meanings” discovered in the data. Thus, each quote has two contexts in relation to which it has been interpreted: first, the interview from which it was taken, and second, the “pool of meanings” to which it belongs. The interpretation is an interactive procedure which reverberates between these two contexts. A step-by-step differentiation is made within the pool of meanings. As a result of the interpretive work, utterances are brought together into categories on the basis of their similarities. Categories are differentiated from one another in terms of their differences. In concrete terms, the process looks like this: quotes are sorted into piles, borderline cases are examined, and eventually the criterion attributes for each group are made explicit. In this way, the groups of quotes are arranged and rearranged, are narrowed into categories, and finally are defined in terms of core meanings, on the one hand, and borderline cases on the other. Each category is illustrated by quotes from the data. … As the meanings of categories begin to form, those meanings determine which quotes should be included and which should be excluded from specific categories. The process is tedious, time-consuming, labor-intensive, and interactive. It entails the continual sorting and resorting of data. Definitions for categories are tested against the data, adjusted, retested, and adjusted again. There is, however, a decreasing rate of change, and eventually the whole system of meanings is stabilized. (p.43)

In Marton’s quotation, little detail is provided about how ‘utterances are brought together into categories on the basis of their similarities’ and how ‘categories are differentiated from one another in terms of their differences’. Few researchers spend time making their process explicit as it is not simply a structured series of steps that can be easily described. The following discussion describes in general terms the process for constituting the categories of description.

From within the pool of meaning, core aspects that make up the ways of experiencing the phenomenon in question are grouped in terms of similar content and structure. The meaning units are read in the context of all those that have come before and in the context of the interviews from where they have been derived. Each fragment informs and helps to delineate the others. At the same time, themes that run through the data are identified and used to structure the logical relationships both within and between the categories as they develop. The analysis alternates between the categories as they are being constituted, the meaning units, and the themes looking to substantiate, contradict or revise the relationships that are emerging.

Trigwell (2000a, p.65) agrees with Marton’s sentiments in the quotation above that the process of analysis is both complex and time consuming. A phenomenographic analysis is not something that can be undertaken piecemeal, or in short bursts of activity. A researcher must immerse himself/herself in the data as it is important to be able to hold the meaning units in focus simultaneously to be able to work with the themes, structures and logical relationships as they emerge.

The categories of description constituted through this analysis make up the ‘outcome space’. As described earlier, this outcome space is ‘the complex of categories of description comprising distinct groupings of aspects of the phenomenon and the relationships between them’ (Marton e Booth, 1997, p.125). The outcome space is thus a robustly constituted set of logically related categories comprising distinct groupings of aspects of the phenomenon. These categories of description are qualitatively different from each other and represent the variation in the way of experiencing the phenomenon. The structural themes give structure to the categories, both in terms of the internal structure, as well and the structural relationship between them. Thus, categories of description are differentiated from one another by the critical aspects of the way of experiencing a phenomenon that they each contain.
CONCLUSION

This paper has argued that phenomenography is not only a research approach to investigate the experience of phenomena such as the understanding of technical concepts, but should be seen as “an approach to identifying, formulating, and tackling certain sorts of research questions” (Marton & Booth, 1997). Embracing a methodology like phenomenography will mean that academics no longer need to draw on anecdotal evidence to be support their discussions around pedagogic issues and the results will be able to directly inform their teaching practice.

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