Post-Doctoral Researchers' Conceptions of Research: A Metaphor Analysis

Rod Pitcher and Gerlese S. Åkerlind

The Centre for Educational Development and Academic Methods, The Australian National University, Canberra, Australia.

Rod.Pitcher@anu.edu.au

Abstract

This paper uses the analysis of metaphors to study the conceptions of research held by a sample of post-doctoral researchers at five Australian universities. It is based on an analysis of the metaphors the researchers use in describing their research. The study produced four concepts that we have labelled 'research is explorative', 'research is spatial', 'research is constructive' and 'research is organic'. This study is unusual in its focus on post-doctoral researchers and the use of metaphors to identify their conceptions of research. The primary aim of the study was to produce a view of post-doctoral researchers conceptions of research. A secondary aim was to demonstrate the usefulness and effectiveness of metaphor analysis as a method of studying those conceptions of research. The study achieves both of those aims.

Introduction

When the topic of research is discussed it is often mistakenly taken for granted that everyone understands the meaning of, and has the same conception of, 'research' (Brew 2001: 271). However, the literature shows that even within similar groups, there is a wide variation in such conceptions and understanding of the meaning of research. The differences in conceptions of research, either between groups of academics or between academics and non-academic staff or students, can cause misunderstandings that prejudice the communication between the people involved. It is the conception of research that is important in the communication process.

Conceptions of research have been investigated amongst different academic groups, such as senior academics, supervisors and students, without producing any single understanding of the term 'conceptions' (See Brew 2001; Åkerlind 2008; Bills 2004; Kiley and Mullins 2005; Meyer *et al* 2005, 2007). All the investigations that have taken place to date have produced different descriptions and categories of conceptions of research not only between studies but also between individual participants within the studies.

Although there is a growing body of literature, as listed above, on conceptions of research as they are held by different groups of people in the academic field, there appears to be nothing that specifically explores, as this paper does, the conceptions of research held by post-doctoral researchers (PDRs). Since PDRs have not yet been investigated to find out their conceptions of research we think that, as a group, they are

worthy of attention. It will be interesting to discover how they differ from other groups in that they are no longer students as they have passed their PhDs but are still 'junior' academics and are involved exclusively in research. Furthermore, previous studies used various methods such as phenomenography, participant-observation, focus group conversations, surveys and questionnaires to explore conceptions of research. This paper takes a novel approach in gathering the metaphors that the participants use to describe research in the transcripts and using metaphor analysis to analyse them. If all the previous studies cannot provide a consensus on the categories of conceptions of research due to a variety of methods then perhaps metaphor analysis can provide a set of appropriate categories that will be acceptable.

This paper proposes answers to the questions "What are post-doctoral researchers' conceptions of research and how are those conceptions revealed by the metaphors they use in describing their research?". The results will add another perspective to the growing literature on conceptions of research. It is hoped that the different approach taken in this study will produce a new view of PDRs' conceptions of research that will help to broaden our understanding of the researchers and their conceptions. We would argue that the more perspectives there are relating to conceptions of research the better the understanding of the topic. This paper offers such an alternative perspective.

Review of the Literature

Conceptions of Research

There have been a number of investigations of the conceptions of research held by different types of researchers. Some examples are post-graduate students (Meyer *et al* 2005, 2007), academic researchers (Brew 2001; Åkerlind 2008), and supervisors (Bills 2004; Kiley and Mullins 2005).

Meyer *et al* (2005, 2007) found eight categories of conceptions of research amongst students;

- research as information gathering, where the emphasis is on gathering as much information as possible to solve a problem.
- research is about discovering the truth, where searching for and establishing the truth or validity of a topic through research is important.
- research is about insightful exploration and discovery, where research seeks out new insights into existing knowledge.
- research is about analytical and systematic enquiry, where the process of research is systematic and directed at a particular purpose.
- research is about incompleteness, where research is seen as never ending, in that there is always something new to be determined from new or old data and facts.
- research as the re-examination of existing knowledge. Research into old topics is useful in that it can produce new

insights or conclusions or be a check for the validity of old ones.
- research is problem based, where the process of research is to identify problems, study the problems and solve them.
- misconceptions about research.

Brew's study of senior academics produced four categories labelled 'domino', 'trading', 'layer' and 'journey' (Brew 2001: 276). These category names were chosen to illustrate the ideas about research and the conceptions of it held by the participants.

- In the 'domino variation' research is viewed as a series of separate tasks, events, experiments, issues, ideas and questions all of which have a distinct existence within the research itself.
- In the 'trading variation', the importance of research is seen in the results it produces in the way of grants, publications, and recognition.
- In the 'layer variation' the researcher endeavours to bring to light new truths or explanations by opening up the underlying layers of explanation and research.
- In the 'journey variation' the researcher grows with her or his research by achieving greater understanding of the area in which the research is undertaken.

Åkerlind (2008) describes four categories amongst the academics interviewed that are arranged in a nested hierarchy of inclusiveness in that the characteristics of the earlier ones are also found in the later ones, thus representing a broadening of the researchers' understanding of what research means and their attitudes towards it. The initial categories are characterised by a more self focused tendency on the part of the researcher and the later ones are more externally focused on the products of research.

Åkerlind's categories include a particular focus on the perceived purpose of research and are further described as:

- Being a researcher to fulfil academic requirements. This is accompanied by an external focus on publication and there is little concern with whether the topic of the research is internally or externally determined.
- Being a researcher to establish oneself in the field. Here research is experienced as a personal achievement. The hoped-for outcome of the research is becoming better known and recognised in the field.
- Being a researcher to develop oneself personally. Here research is a means of attaining personal understanding.
- Being a researcher to enable broader change, a more altruistic focus in that the benefits and results should extend to the wider community. The research is aimed at producing some gain for the discipline or social group.

The conceptions held by the research supervisors in Bills' study were shown by the way they divided research into the binary categories of the research made in the university (Big-R research) and that made outside the university (Little-r research) (Bills 2004: 88).

Bills found the following characteristics in university research:

- It is methodical and rigorous and is a systematic way of finding information.
- It lies within a theoretical and conceptual tradition.
- It is an advancement of knowledge.
- It develops insights by theorising and deep thought.
- It involves explanation, conceptualising and argument.

Kiley and Mullins found that two-thirds of the supervisors could be placed in a category they called 'technical', which was itself divided into four sub-categories, 'basic technical', 'cautiously technical', 'ethical/honest' and 'relevant/innovative' (Kiley and Mullins 2005: 249-50). The remaining third of the supervisors were divided into three groups. The three groups were labelled 'creative/innovative', 'integrating complexity' and 'new ways of seeing' (Kiley and Mullins 2005: 250).

They explain the categories further:

- 'Basic technical' where there is a focus on research as a set of defined steps that will produce a result.
- 'Cautiously technical'. As above, but also including the importance of communicating results to the wider community of scholars.
- 'Ethical/honest'. As above, but emphasising honest and unbiased practices.
- 'Relevant/innovative'. As above, but adding that research should be relevant and applicable.
- 'Creative/innovative' where creativity and innovation are seen as important in addition to originality. Research is about the creation of new knowledge, and innovative ways of discovering that new knowledge.
- 'Integrating complexity' where the emphasis is on bringing together data and ideas in new ways.
- 'New ways of seeing' the world, oneself or problems. Good research opening new views, illuminating the problem, and generating new lines of enquiry.

Comparison of the Studies

It is useful to compare the themes that emerged in each study and see how they overlap or correspond to the themes of other studies. In addition to common themes across studies, it is also apparent that some similar themes occurred within the findings of any one study, that is, different categories of one study often contain similar themes. Below we identify the five most reliable themes in that they emerged in all the studies.

- Research as adding to what is already known, occurs in Meyer's *et al's* 'research is information gathering', Kiley's and Mullins' 'creative/innovative', Bills' 'advancement of

knowledge', Åkerlind's 'being a researcher as enabling broader change' and Brew's 'layer variation'.

- Research as seeking new insights is common to more than one category of all the studies such as Meyer's *et al's* 'research is about insightful exploration' and 'research is the re-examination of existing knowledge', Kiley's and Mullins' 'creative innovative', 'integrating complexity' and 'new ways of seeing', Brew's 'layer variation' and 'journey variation, Åkerlind's 'developing oneself' and 'enabling a broader change', and Bills' 'advancement of knowledge' and 'developing insights'.
- Research seen as a systematic process directed at a purpose is found in Meyer's *et al's* category with a similar name, Kiley's and Mullins' 'basic technical' and 'relevant/innovative, Brew's 'domino variation', all of Åkerlind's categories, and Bills' 'being methodical and rigorous'.
- Research seen as the results it produces for the researcher is very common and occurs in more than one category of most of the studies, such as Brew's 'trading variation', Kiley's and Mullins' 'basic technical', 'ethical/honest' and 'new ways of seeing', Åkerlind's 'being a researcher as establishing oneself in the field, 'being a researcher as developing oneself personally' and 'being a researcher as enabling broader change', Bills' 'advancement of knowledge' and 'theorising and deep thought', and most of Meyer's *et al's* categories.
- Research being important as a way of explaining and understanding is found in Brew's 'journey variation', Kiley's and Mullins' 'new ways of seeing', Åkerlind's 'being a researcher as developing oneself personally', Bills' 'theorising and deep thought' and 'explanation, conceptualising and argument', and Meyer's, Shanahan's and Laugksh's 'insightful exploration and discovery', 'research is about analytical and systematic enquiry' and 'research is the re-examination of existing knowledge'.

Metaphor Analysis

As the name implies, metaphor analysis is a systematic method of analysing the metaphors that people use to express themselves. It is a means of gaining understanding of a person's often unconscious motives and reasons for doing something or of their conception of the process involved in doing it. It can often reveal the thoughts behind the action. In discussing metaphors Steger (n.d.:1) makes the point that they are often unconsciously generated. It is for that reason that they are a useful way of investigating people's attitudes and conceptions. Since the metaphors are typically unconscious they can be assumed to reflect the person's underlying feelings and understanding, which they may be unable or unwilling to express consciously.

There is a considerable body of work using metaphor analysis. For further discussion of its usefulness and effectiveness see also, for

instance, Martin and Lueckenhausen (2005), Moser (2000), and Allan (2007).

As Brown *et al* state:

> *The premise behind this methodology [metaphor analysis] is that by examining the metaphors that human beings use in describing their experiences and beliefs, researchers can begin to uncover meanings beneath those the writer or speaker directly or consciously articulates.* (Brown *et al* 2005:3).

Written material, such as transcripts of interviews, is always used, so that it may be examined a number of times to ensure that all the metaphors are found. Indeed, the search for, and finding of, all the metaphors is of the utmost importance for the analysis. The material has to be examined closely, then examined again and again to ensure that all the metaphors are found. This step is particularly important as some of the metaphors might be obscure and might be missed on the first, or even second, reading. Reading of the material must continue until all the metaphors are found. If any metaphors are missed they may skew the interpretation in directions that invalidate the results or prevent their generalisation.

Consequently, the first step in metaphor analysis is the finding of all the metaphors in the material. Schmitt states that a word or phrase can be seen as a metaphor if, firstly, it can be understood beyond the literal meaning in the context, that is, it has a figurative meaning. Secondly, the literal meaning must stem from an area of experience (the source area), and thirdly, the meaning is then transferred to a second, often abstract, area (the target area, in this study being the nature of research) (Schmitt 2005: 371).

Once all the metaphors in the transcripts have been found they can be combined into concepts. Lakoff and Johnson show metaphors can be grouped into related 'metaphorical concepts'. The metaphorical concept relates the target and source domains of the metaphor. Thus, if a person uses the metaphor of a journey to describe his or her research, then the concept is 'research is explorative', with 'research' being the target domain and 'journey' the source domain since 'research' is the subject of discussion and 'journey' is the domain to which it is linked by the metaphor. Part of the metaphor analysis process involves grouping metaphors into metaphorical concepts that illustrate the relationship between the target domain and the source domain (Lakoff and Johnson 1980: *passim*).

Methodology

The purpose of this investigation is to understand a sample of post-doctoral researchers' conceptions of research. The approach taken is an analysis of the metaphors that those sampled use in describing their research. The material used for the analysis consists of transcripts of interviews with PDRs in a number of Australian universities.

The term ‘conception’ has different meanings in different contexts. In this paper we are using it to mean a complex of how and what people think about a topic, understand by it, and the meaning that it has for them. A conception is typically associated with a corresponding representation such as a word or phrase. In this investigation conceptions are assumed to be associated with the metaphors used to express them. Specifically, for the purposes of this investigation, PDRs’ conceptions of research are assumed to be associated with the metaphors that they used in interviews to describe their experience of post-doctoral research.

In discussing the validity of metaphor analysis, Schmitt suggests that metaphor analyses must provide the possibility of testing their accuracy and credibility. The ways in which the results are to be validated should not merely be applied to the actual analysis but should be applied throughout the whole investigation (Schmitt 2005: 380).

Data Collection

The PDRs were interviewed by Åkerlind. Twenty-two interviews were recorded on the tapes from which the transcripts were made. Åkerlind used open-ended questions to explore the subject in detail. The semi-structured questions consisted of a group of core questions followed by varied probes that delved into the participants responses.

The interviews took place around the year 2000, in five research-intensive universities in four states of Australia. The participants were chosen from those who completed a nation-wide survey (Thompson *et al* 2001) to represent, as far as possible, the demographic variation in PDRs with the aim of capturing variations in conceptions of post-doctoral research. Each interview took approximately 60 minutes.

Of the participants 10 were women and 12 were men, ranging in age from 25 to 60. Fifteen were Australian and 7 were from other countries. Fields of research were mathematics (1 participant), physics (2), chemistry (2), earth sciences (2), engineering (3), biological sciences (2), agriculture (3), health sciences (4), social sciences (1) and humanities (2). The number of years as a PDR ranged from one to 23 years, and terms of appointment ranged from one to five years.

The questions including “What does being a postdoc researcher mean to you?”, “How is what you do as a postdoc researcher different from what you were doing as a doctoral researcher or other types of research? Can you give me a sense of what you do in your position?”. These questions were intended to bring out the interviewee’s ideas on what it means to be a PDR and what research means to him or her. These core questions were accompanied by follow-up probes.

Three of the 22 transcripts proved to be unsuitable for metaphor analysis due to the poor command of English of the interviewees and the resultant fragmentation of the replies, so the final sample for this study was 19 PDRs.

Data Analysis

Pitcher led the data analysis. He began by reading each transcript through thoroughly. The aim was partly to familiarise himself with the material, but he was also looking for anything that was not relevant to the current analysis. Since the interviews covered a larger range of academic topics than post-doctoral research not all of the material was usable in an analysis relating to conceptions of research. For instance, other topics discussed in some of the interviews included teaching and supervision. Topics other than research were not considered in this analysis.

Pitcher's next step was to read the transcripts again looking for metaphors. Leaving a day or more between readings allowed a fresh look to be taken. It was necessary to read the transcripts a number of times over a period of time to ensure that all the metaphors were found. Once a reading produced no more new metaphors it was assumed that all had been found. As he read each transcript every word and phrase had to be considered, and its context taken into account. Is the word or phrase used literally or figuratively? The literal uses are not metaphorical. The terms have to be considered as to whether they are used metaphorically or not in the context of the rest of the transcript.

After reading all the available transcripts three times Pitcher took each transcript individually and wrote the metaphors contained within it onto a sheet of paper. He then linked together the metaphors from that transcript that could be grouped within the same concept. His aim was to produce a map of all the metaphors used in each transcript to find the dominant metaphorical concept, that is, the one that was referred to the most in each transcript.

An example of the metaphors found and how the dominant metaphorical concept was identified within them in one transcript can be seen in the following extract from one transcript. The interviewee said that research can have "some pretty dark times" where "a lot of people fall by the wayside". There was mention of being "free to explore", which includes being free to "go down the speculative path". The interviewee mainly used metaphors of a journey of exploration – "wayside", "to explore" and "path" – thus the dominant metaphorical concept is that of 'research is explorative'.

The 'dominant metaphorical concept' was thus identified from the fact that more metaphors in the particular transcript fitted into that concept than any other. At the same time, there were usually additional minor metaphorical concepts expressed.

The proportion of metaphors in the transcript that related to the dominant metaphorical concept to those in other concepts varied from marginal to total across the range of transcripts. Any remaining concepts were considered as 'minor metaphorical concepts'. Most, but not all, transcripts contained a number of such minor concepts as well as the dominant concept.

Following this within-transcript analysis of metaphors an across-transcript analysis was undertaken. The dominant concepts across transcripts were written down and grouped into common conceptions, in a similar manner to the within-transcript analysis. The categories were seen as representative of the conceptions of research found in the transcripts.

The dominant metaphorical concepts from all the transcripts were considered and were named on the basis of the dominant concepts. Each transcript was then allocated to the category which matched the dominant metaphorical concept that appeared in it. It was found that all the transcripts fell into one or other of the categories based on their dominant concept so it was not necessary to formulate any extra categories. The categories are described, below, with some examples of the metaphors and concepts obtained from the transcripts included in the explanation of the results.

Results

The analysis yielded four categories of dominant conceptions: 'research is explorative', 'research is spatial', 'research is constructive' and 'research is organic'. The names we have given to the concepts and categories reflect the participants' conceptions of research and their approaches to it as shown by the metaphors that they used in the interviews.

In most transcripts there were also metaphors in minor concepts related to categories other than the one in which the transcript was placed. However, the metaphors in these minor concepts were less used in the particular transcript than the dominant metaphorical concept which determined the category into which the transcript was placed. All the minor concepts found in the transcripts also fell within the four categories.

As examples of the separation of the metaphors into concepts, dominant metaphorical concepts and core categories the analytical process for one transcript in each category is described. The process described can then be taken as typical of that for all the transcripts in each category.

The four categories that emerged in this study, 'research is explorative', 'research is spatial', 'research is constructive' and 'research is organic', tell us something about PDRs' understanding of what research entails. The transcripts in each category describe research differently and indicate different conceptions of it. The transcripts show research as exploration and discovery, as a field of interest and discovery, as a contribution to the erection of an edifice of knowledge and as the development and growth of an organic entity, respectively. The transcripts also displayed different themes which illustrate the ways in which the participants in the particular category view their research.

The decision as to what to name the categories of conceptions of research took some thought. The concept of 'research is explorative' was arrived at after considering 'research is a journey' and 'research is an odyssey'. Both were rejected because they didn't express the idea of exploration which seemed important. 'Research is spatial' was the first choice of name allocated to the concept and fitted our idea of an area or space in which research takes place. 'Research is constructive' was decided upon after starting with 'research is building' and was adopted as being broader in conception than being simply related to buildings. 'Research is organic' was decided upon after considering 'research is an organic thing' and 'research is living'. The earlier names were rejected as

not properly giving the wanted impression, or because they did not satisfy our sense of the required meaning.

Research is Explorative

Transcripts in the 'research is explorative' category typically include metaphors related to traversing a terrain or path to describe research.

A transcript in this category refers to 'a stepping stone' twice, 'getting my feet off the ground', 'dipping into different areas' and a 'long term goal'. Thus this transcript is placed in the 'research is explorative' category since there is an explorative feel to it.

This transcript had two minor concepts. It refers to the 'field', and different 'areas' which suggests 'research is spatial'. As well it refers to 'a common thread' which suggests the 'research is constructive' category. It can be seen, then, that this transcript overlaps two other categories.

Research is Spatial

Transcripts that fit into the 'research is spatial' category refer to 'the area' of research. There is a sense of spreading out into an area of knowledge through the research.

One of the transcripts in this category refers to 'different areas' of research, and 'narrowing the scope', although 'it is broad'. The transcript refers to 'the field' and 'the areas' a number of times. Thus this transcript is placed in the 'research is spatial' category since the person appears to want to indicate the breadth and spatial qualities of research.

This transcript had two minor concepts. Reference is made to 'targets' which suggests the 'research is explorative' category and research is said to be 'fruitful' and 'feeding off' other research, which suggests the 'research is organic' category. Thus this transcript can be seen to overlap two categories other than the one to which it is allocated due to its dominant concept.

Research is Constructive

The participants in the category of 'research is constructive' conducts research to add to knowledge and to help in constructing its structure. Typical metaphors used in the transcript in this category include 'filling in the gaps' in knowledge. There is a sense that the person wants to add to the accumulated body of what is known.

A transcript in this category used the metaphor of research 'filling a gap' three times. As well, it said that research has 'certain targets' and that the interviewee has a desire to see the 'bigger picture'. It can be seen that the metaphor of 'filling the gap' is the dominant one since it appears more than all the other metaphors put together. This metaphor is placed in the 'research is constructive' concept since it appears that the person wants to help build up the body of knowledge by 'filling in gaps' in what is already known. Thus this transcript is placed in the 'research is constructive' category.

The minor concept in this transcript is formed from the metaphor of 'targets'. It is suggested that 'targets' might be part of the concept of 'research is explorative' and thus overlaps that category. In that case the

transcript can be seen to slightly overlap a category other than the one allocated to the dominant concept.

Research is Organic

The transcripts in this category used metaphors that have a reference to life and organic things. In this transcript, research might 'die' if it doesn't have 'a good run', and the researchers 'get a kick' out of doing research. Here there is a feeling of research being organic and alive for the researcher.

The only transcript in this category used only metaphors that referred to life and organic things to express the conception of research. The transcript said that the research 'dies' if funding is not available, but otherwise the researcher has 'a pretty good run' of it. In this transcript the research is 'the biggest buzz' and the interviewee gets 'a kick out of it'.

Since this transcript only used metaphors that fitted in the concept 'research is organic' it is easy to see that it must be the dominant metaphorical concept and that the transcript belongs in the 'research is organic' category.

This transcript does not have any metaphors that make up minor concepts, therefore there is no overlap with other categories.

Discussion

In the following discussion the reader should keep in mind the limited number of transcripts used in the analysis. That is, the relative frequencies of the categories may differ for a larger or different group of interviewees.

In this study the largest number of transcripts in the sample were placed in the 'research is spatial' category. The 'research is explorative' category was slightly smaller. The categories of 'research is constructive' and 'research is organic' contained much smaller numbers of transcripts.

It can be seen from the above descriptions of the formation of the categories that some transcripts overlap one or more category other than the one to which they are allocated due to their dominant concept. However, not all do so. Some transcripts contain only metaphors that constitute their dominant metaphorical concept and hence do not overlap other categories. Why this should be is not apparent from the transcripts. It can be surmised that some interviewees may have narrower conceptions of research and only need metaphors that formed one concept to indicate that conception whereas those with a broader conception of research used wider ranging metaphors from a number of concepts to express their conceptions or experience research differently in different contexts.

There did not seem to be any close relationship between the conception of research shown in the transcripts and the interviewee's field of study. It appears that the dominant metaphorical concepts are not discipline-specific, and thus that the differences in the conceptions of research are not specific to the participant's discipline nor the area of research. Further studies might reveal a relationship between conception of research and discipline or with age and gender.

It might be worthwhile to speculate a little about the attitude of the researchers in the particular categories to illustrate some of their conceptions However, the following are merely speculations and are the impressions gained from reading the transcripts rather than direct outcomes of the analysis.

It can be speculated that the 'research is explorative' participant sees research as an adventurous journey, a journey of exploration and discovery into the unknown which will result in the reward of knowledge. It is suggested that to the 'research is explorative' participant the act of going out looking for data is the most important part of research. He or she will follow the leads of the research and will delve into by-ways if they look interesting. Perhaps this person will not know where the research will lead until it is completed, as serendipity plays a large role in this person's research. The researcher's focus is on the paths through which the data is obtained. Knowledge, it is surmised, will be the results of the overall expedition. It will be scattered and require interpretation to bring it all together and make it useful.

To the 'research is spatial' PDR research can be thought of as spreading out into wider areas. Research involves searching the wider area for ideas and results. Knowledge is seen as something that might be found anywhere so the researcher sees advantages in following leads that might appear fortuitously for the possible results produced. Serendipity plays a large role in this type of person's research.

The 'research is constructive' participant, it can be speculated, tries to make new discoveries that add to the edifice of knowledge. This person helps build knowledge by adding something new, like bricks to a structure, or filling in gaps in knowledge. Knowledge is seen as an edifice which research helps to build. The focus of the research is the addition to knowledge that it produces and how that extra knowledge fits into what is already known.

The participants in the 'research is organic' category, it may be suggested, see research as a organic, evolving, entity that changes as the research goes on. Research is seen as developing as the researcher continues with the work. The focus here is on the researcher who grows with his or her research and on the research as a growing body of knowledge. Knowledge is seen as developing with the research and growing as more is discovered.

There are some similarities between the themes found in our categories and those of the previous investigations described above. It will be noted that some themes from the previous investigations are present in a number of our categories whereas others are not present in any category. A sample of the similarities in themes between the previous investigations and this one follows.

Our category of 'research is explorative' bears some similarities to those that Meyer *et al* place in the category of 'research is about incompleteness' and 'research is about insightful exploration and discovery', that Kiley and Mullins call 'creative/innovative' and 'new ways of seeing' and Brew's 'layer' variations.

Our ‘research is spatial’ category is similar to Meyer’s *et al’s* ‘research is information gathering’ and ‘research is incompleteness’ categories, Brew’s ‘layer’ and ‘domino’ variations, and Kiley’s and Mullin’s ‘new ways of seeing the world’.

Our category of ‘research is constructive’ is similar to the category that Meyer *et al* describe as ‘research is information gathering’, that Kiley and Mullins call ‘creative/innovative’, that Bills calls ‘advancement of knowledge’ and that Brew calls the ‘layer’ variation.

Our ‘research is organic’ participants have similar characteristics to those in the categories that Meyer *et al* name ‘research is information gathering’, that Kiley and Mullins name ‘creative/innovative’, that Bills names ‘advancement of knowledge’ and Brew’s ‘layer’ and ‘journey’ variations.

Conclusion

The primary aim of this investigation was to arrive at a set of categories reflecting PDRs’ conceptions of research as they appeared in one set of transcripts of one set of interviews undertaken at one particular time. In doing so it has helped to fill a gap in the investigation of conceptions of research by studying PDRs. A second, and equally important purpose of this study, was to demonstrate the usefulness and possibilities inherent in the use of metaphor analysis as a method of investigating conceptions of research. We feel that the study has satisfied those aims.

This investigation has shown that PDRs’ conceptions of research can be sorted into categories that tell us something about how the participants within the category understand research. The categories have been named for the dominant concept that appeared in the transcripts of interviews with the people who fall within them. Those dominant concepts indicate the range of the participants’ conceptions of research.

This study examined variations in conceptions of research held by a group of PDRs. Future research might consider whether the categories found are typical of all such groups or whether there are differences related to field of study, gender, cultural background, or type of university. A further area for possible future research is the way in which the conception held by a person influences her or his chosen research topic and method of research. The study could also be extended further to examine the conceptions held by the same person at different stages of his or her career, for instance as doctoral student, post-doctoral researcher and academic, and note if they change.

Acknowledgements

The survey from which the participants of this study were selected was funded by the Evaluation and Investigation Programme of the Australian Department of Education, Training and Youth Affairs (DETYA) and by the Centre for Educational Development and Academic Methods of the Australian National University, Australia.

We thank Dr. Linda Hort of The Australian National University for her perceptive and constructive comments on earlier drafts of this paper.

References

Åkerlind, G.S. (2008). 'An Academic Perspective on Research and Being a Researcher: An Integration of the Literature'. *Studies in Higher Education* 33(1): 17-31.

Allan, C. (2007) 'Exploring Natural Resource Management with Metaphor Analysis'. *Society & Natural Resources*. 20(4): 351-362.

Bills, D. (2004). "Supervisors' Conceptions of Research and the Implications for Supervisor Development". *International Journal for Academic Development* 9(1): 85-97.

Brew, A. (2001). 'Conceptions of Research: A Phenomenographic Study'. *Studies in Higher Education* 26(3): 271-285.

Brown, P.U., S.C.Parsons, and V.Worley. (2005). 'Pre-Service Teachers Write About Diversity: A Metaphor Analysis'. Retrieved on 7/2/2008 from <http://www.encyclopedia.com/printable.aspx?id=1G1:146073795>.

Kiley, M. and G.Mullins. (2005). "Supervisors' Conceptions of Research: What Are They?". *Scandinavian Journal of Educational Research* 49(3): 245-262.

Lakoff, G. and M.Johnson. (1980). *Metaphors We Live By*. Chicago and London: The Chicago University Press.

Martin, E. and G.Lueckenhausen. (2005). 'How University Changes Teachers: Affective as Well as Cognitive Challenges'. *Higher Education*. 49:389-412.

Meyer, J.H.F., M.P.Shanahan, and R.C.Laugksch. (2005). "Students' Conceptions of Research I: A Qualitative and Quantitative Analysis". *Scandinavian Journal of Educational Research* 49(3): 225-244.

Meyer, J.H.F., M.P.Shanahan, and R.C.Laugksch. (2007). "Students' Conceptions of Research 2: An Exploration of Contrasting Patterns of Variation". *Scandinavian Journal of Educational Research* 51(4): 415 433.

Moser, K.S. (2000). 'Metaphor Analysis in Psychology – Method, Theory, and Fields of Application'. *Forum: Qualitative Social Research*. 1(2)

Schmitt, R. (2005). 'Systematic Metaphor Analysis as a Method of Qualitative Research'. *The Qualitative Report*. 10(2):358-394.

Steger, T. (n.d.). 'The Stories Metaphors Tell – Metaphors as a Tool to Decipher Tacit Aspects in Narratives'. Retrieved on 7/2/2008 from <http://www.tu-chemitz.de/wirtshaft/ema/metaphor-6.doc>.

Thompson, J., M.Pearson, G.Åkerlind, J.Hooper, and N.Mazur. (2001). *Postdoctoral Training and Employment Outcomes*. EIP Report 01/10. Canberra: Higher Education Division, DETYA.