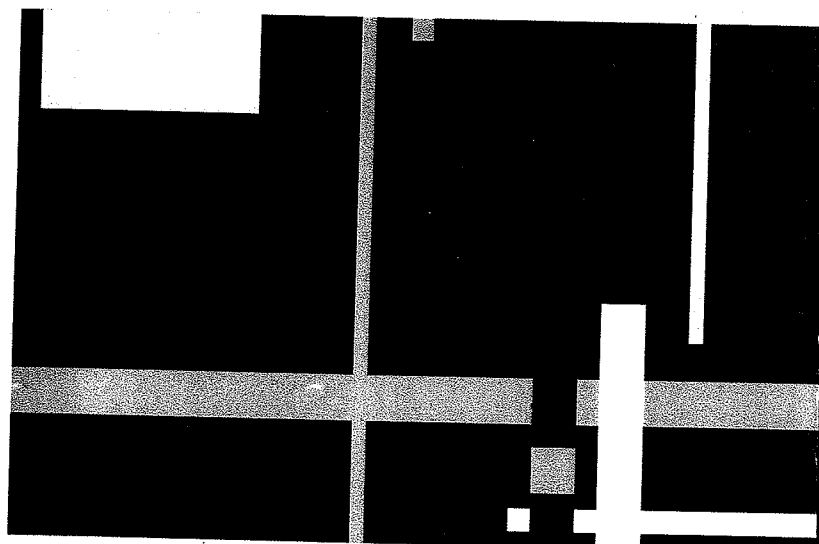


The Society for Research into Higher Education

Academic Research and Researchers

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10

Isn't research just research? What are candidates and supervisors thinking?

Margaret Kiley

Introduction

Several studies have reported on research that has sought to understand people's conceptions of research. For example, there is work that has attempted to identify the concepts of research held by research students (see Meyer et al. 2005; 2007). Others have aimed at identifying the concepts that research supervisors consider that their research candidates hold (Kiley and Wisker, in press) or that research supervisors themselves hold of research (see Bills 2004; Kiley and Mullins 2005). Furthermore, the work of Brew (2001) examined experienced researchers' conceptions of research. From a different perspective, there are examples of studies which have brought together a number of the individual studies to develop a model or different way of viewing the earlier outcomes (for example, Vermunt 2005; Åkerlind 2008).

Following a discussion of these studies this chapter will draw upon new sources of data to address the issue of, 'So what?' Does it really matter that people working together have different conceptions of research and if it does, in what ways?

Context

Some of the most extensive work on research candidates' conceptions of research comes from work reported by Meyer, Shanahan and Laugsch (2005; 2007). Their data were based on an initial study of 154 open-ended responses from respondents who were enrolled in research degrees in Australia and South Africa. Written responses were provided by the respondents to a number of statements including: 'What do you think "research" means in your discipline or subject?' and 'What do you think constitutes "good research" in your discipline of subject?' From that study the investigators developed the Students' Conceptions of Research inventory (SCoRI),

an online inventory seeking to understand what students consider research to be.

The findings from the 224 inventory responses (Meyer et al. 2005) suggested that there was extensive variation in candidates' conceptions of research with eight factors identified. Following this work, the authors repeated their study with an opportunistic sample of 215 respondents (Meyer et al. 2007). The new study confirmed five of the eight factors from their earlier study as outlined in Table 10.1

Table 10.1 Conceptions of research identified by Meyer, Shanahan and Laugsch (2005; 2007)

<i>2005 Study</i>	<i>2007 Study</i>
The gathering of information	Finding out the truth
Discovering the truth	An insightful process
An insightful process	An insightful process
Analytic and systematic enquiry	
Incompleteness	
Re-search or re-examining existing information	Re-searching previous knowledge
Finding solutions to problems	Finding solutions to problems
Misconceptions	Misconceptions

The misconceptions reported in the 2005 study by Meyer et al. included:

Research is about gathering data that support preconceived ideas or that will yield positive results, that when qualified people research, the results are always unbiased, that it is acceptable to modify research if it does not look exactly right, that research becomes true after it is published, that if research is properly conducted then contradictory findings will never occur, and that there is generally only one way to interpret research findings.

(Meyer et al. 2005, p. 236)

Taking a different approach, Yijoki (2001) identified four core narratives in the doctoral experience: heroic, tragic, businesslike and penal. Each of these narratives reflects a particular conception of research and the process of undertaking research at the Masters level. For example, Yijoki's heroic figure states after successful completion: 'You are a completely different person if you have gone through the process as compared with one who has not done that.' Yijoki goes on to say: 'Now the student knows what it takes to be a researcher and they are ready to start another research project, and to meet whatever challenges there are waiting for them in the future' (2001, p. 27). These students, Yijoki argues, commenced their research award with a mythical view of the thesis as being 'a kind of moment of truth where academic abilities are put to a severe test, in which some will succeed and other will fail'

(2001, p. 25). The 'heroic' students are those whose motivation, expectation and conception of the process allow them to view the experience as a struggle, but one which they can manage and emerge 'victorious' whereas the 'tragic' figures believe that the task is too great and that they are inferior or unable to successfully meet the challenge. The businesslike student, on the other hand, does not invest the research experience with mythical characteristics, but rather views it as a way of demonstrating one's worth in a positive manner, yet the 'penal' story views the whole research experience as a punishment, something 'to get ... over and done with' (2001, p. 29). Unsurprisingly, Yijoki's findings were that for the 'heroic' and 'businesslike' figures, the thesis is generally completed and within a reasonable time limit. The 'tragic' figure tends to admit defeat and so does not complete and the 'penal' figure may or may not continue, but is likely to take far longer to complete than one might wish.

A different perspective on research candidates' conceptions of research is based on what research supervisors consider to be the concepts that their research candidates do, or do not, hold. This research is aimed at identifying ways in which supervisors might be able to assist candidates when they are challenged by concepts which are new or different. Based on the theoretical framework of threshold concepts (see Meyer and Land 2006), initial research suggests that there are at least six research-related concepts that many students have difficulty in appreciating. They include the concepts of: argument/thesis, theory, framework, knowledge creation, analysis, and research paradigm (Kiley 2009). Many of the experienced supervisors interviewed as part of a larger study suggest that they are aware of candidates having crossed various conceptual thresholds (Kiley and Wisker, in press) as evidenced through their writing, ways of speaking about their research, and their ability to progress with confidence and understanding.

Other studies have been undertaken regarding researchers' and research supervisors' conceptions of research. For example, Bills (2004) reported on the outcomes of focus group conversations that were designed to investigate research supervisors' conceptions of research. Using discourse analysis, Bills found that university researchers, all of whom were supervisors of research candidates, 'privileged university-based research and researchers over other forms of research and other ways of knowing, in particular over the interests of professional/practitioner researchers and over the legitimacy of research conducted in workplaces outside the university' (2004, p. 85). The difference that Bills noted was that the participants had defined small 'r' research (perhaps market research, or a research project undertaken by a school student) and big 'R' research (the type of research that is undertaken in universities and formal research institutes).

Another approach to identifying the ways in which supervisors viewed their own research and that of their research students, that is 'academic' research, was reported by Kiley and Mullins (2005) and Kiley (2007). Fifty-three supervisors in Britain, Australia, South Africa and New Zealand were surveyed using a web-based questionnaire. The respondents, themselves generally

research-active as a requirement for supervising doctoral candidates in most universities, were asked to comment on what they thought was 'good' research as well as a 'good' researcher. The responses were analysed in two different ways to determine major themes and concepts. The first, when analysed for internal consistency of each supervisor's response, determined that two-thirds of the responses to the question 'What is "good research"?' could be labelled as 'technical' that is 'the rigorous application of systematic methods to well-defined problems within a particular disciplinary context' (Kiley and Mullins 2005, p. 249). The other third of the responses were categorized as 'speculative'. That is, they reported such qualities as creative/innovative, new ways of seeing and integrating complexity. The second analytic method examined the consistency across responses to questions from all respondents and this highlighted eight different categories with regard to conceptions of research: systematic inquiry, systematic inquiry with a purpose, hypothesis testing, critical inquiry, development of the discipline, discovery or production of new knowledge and understanding, and 'what academics do' that is, academic scholarship (Kiley and Mullins 2005, p. 253).

Many of the interviewees in the Brew (2001) study were not defined as supervisors of research candidates, but rather experienced researchers (which might well mean that they are supervising doctoral students, but that cannot be assumed). Following 57 interviews with experienced researchers, Brew proposed four different variations of understanding research. The first, *domino* suggested that 'research is viewed as a series of separate tasks, events, things, activities, problems, techniques, experiments, issues, ideas or questions, each of which is presented as distinct' (2001, p. 276). The *training* conception, on the other hand, was, as its title suggests, where the researcher undertakes research in order to trade for other things such as promotion and recognition. Research as *layers* argues that 'research is bringing to light the ideas, explanations and truths lying in the background by illuminating or uncovering the underlying layer [of knowledge]' (2001, p. 278). The final conception outlined by Brew is that of the *journey* where research informs, and is informed by, life issues.

Examples of the fifth type of study referred to in this chapter is the type undertaken by Vermunt (2005) and Åkerlind (2008) where they examine other stand-alone studies and develop an overview or model from those studies.

Vermunt (2005) compared the various categories presented in a range of papers that had been submitted to a special journal issue on the topic of conceptions of research. Across the six reported studies two conceptions were reported across most of the studies. The first was the concept of insightful exploration, discovery, and creation of new knowledge. The second related to a systematic, rigorous and analytical process. Of particular interest to the study reported here are Vermunt's questions as to whether conceptions are stable over time and whether some changes are essential and others non-essential for undertaking successful research. Vermunt suggested that areas for further study included:

- 1 similarities and differences between students and researchers;
- 2 relationships between students' and supervisors' conceptions of research and the effects of the differences;
- 3 attempts to integrate the different conceptions.

The third was addressed to some extent in the study by Åkerlind (2008). Examining eight studies related to the ways in which academics understand research, of which four have been discussed already as examples in this chapter (Bills, Brew, Kiley and Mullins; and Meyer et al.), Åkerlind argued that the different studies she included in her analysis, as well as her own research, looked at different aspects of research that is, research intentions (who is affected by the research), research outcomes (the anticipated impact of the research), research questions (the nature of the object of study) and research process (how research is undertaken). Hence we have studies that attempt to identify:

- research candidates' understandings of research (for example, Meyer et al. 2005; Ylijoki, 2001; Meyer et al. 2007);
- research supervisors' understandings of what they consider to be the concepts that their candidates need to address to become researchers (Kiley, 2009; Kiley and Wisker, in press);
- research supervisors' own understandings of research, particularly as it relates to doctoral level research (Bills, 2004; Kiley and Mullins, 2005);
- experienced researchers' conceptions of research (Brew, 2001);
- models emerging from the bringing together two or more of these individual studies (Vermunt, 2005; Åkerlind, 2008).

The specific aim of this chapter is to discuss the question: what do these views mean for practice? Furthermore, with a very explicit focus related to the overall purpose of this book, what might be the implications of these views and understandings when one considers that it is possible that half of those current doctoral candidates will be the new cohort of academic researchers?

Method

Eight focus groups, four involving 18 research candidates and four with 13 research supervisors, were undertaken over a period of several days in one large Australian university (see Tables 10.2 and 10.3). The candidate focus groups involved participant numbers ranging from two to seven per group and contained a disciplinary mix including: English, anthropology, art and politics; education, social work, management and marketing; health and bio-medical science; and information technology. Of the 18 candidates, five were in the early stages of candidature, seven mid-way and the remaining six in the final stages of their research degrees. All but two, who were enrolled in a research masters, were undertaking a doctorate.

Table 10.2 Candidate participants in study

Gender	Stage of candidature			Disciplinary groups				
Male	Female	Early	Mid	Late	Humanities	Social Science	Science/Health	Engineering/IT
6	12	5	5	7	6	4	11	2
								1

Note: n = 18.

Table 10.3 Supervisor participants in study

Gender	Experience of supervision			Disciplinary groups				
Male	Female	Early	Mid	Late	Humanities	Social Science	Science/Health	Engineering/IT
8	5	4	3	6	2	2	6	3

Note: n = 13.

The candidates were asked to discuss a number of issues including how they would describe research in general terms, in the university system and in their own discipline. They were also asked what they thought were the main reasons for undertaking research and then the characteristics of 'good' research and 'good' researchers.

Thirteen supervisors were engaged in the research, again, these were involved in four focus groups with numbers in each group ranging from two to five. The groups contained a disciplinary mix which included: engineering and urban planning; physiotherapy, nursing and medical radiation; physics and mathematics; history and English; and business and management. The participants were currently supervising, with experience as a researcher and supervisor ranging from extensive through to early career. The supervisors were asked to comment on similar questions to those above. However, they were also invited to comment on the characteristics of a 'good' research student and then to comment on the research capability of candidates they were currently supervising.

It is important to note that the supervisors were not necessarily those of the students in the candidate focus groups and there was little, if any, overlap in terms of location and time of the focus groups, hence the candidate and supervisor focus groups can be considered to be quite separate.

Findings

Given the focus of this chapter, to provide an in-depth analysis of the candidate and supervisor comments is not possible. That analysis is

provided elsewhere (Kiley and Mullins 2005). However, the findings here attempt to highlight differences in the views of candidates and supervisors. Metaphor and analogy abounded in the focus groups with some of the quotations below demonstrating their creative use. However, a particularly graphic description was provided by a supervisor, Jack (note that where quoted, pseudonyms have been used) who reported that:

I teach my students about the bowl of knowledge. I'm not sure you've heard of this. When you're in primary school, before you get to university, you're given a bowl, it's filled for you and they make you drink. When you get to the undergrad level, you're given a bowl, it's filled, but whether you drink it or not is up to you. At the Masters level, you're given the bowl, whether you fill it and drink it is up to you. And at the PhD level, go find your own bowl.

Perhaps the most telling finding from this small study is the differences between candidates in their descriptions of what they thought research to be. Not surprisingly, the candidates all used their own research topic and experience as the basis for their examples. In fact, it was very difficult to get them to discuss research in a broader context than their own research education.

Relating the findings to previous research frameworks, it is of interest to note that several candidates described research in terms that might be described as *insightful process*, particularly with the idea of making links and integrating existing or new knowledge. For example: 'Investigating the unknown and providing the missing links' (Patrick) and 'Filling in gaps or integrating existing knowledge in new ways' (David) and put simply 'Integration' (Frank). The idea of new ways of seeing knowledge was further advanced in the following comment by Emma, 'Looking at a new idea, investigating a new direction or way of looking at things. A new approach.'

Others discussed research as finding out the *truth*, e.g. 'Having a question and then finding other people who might have asked the same question and trying to integrate their perception of the truth' (Sharon). There was considerable discussion regarding the use of the term 'truth' in two of the four candidate groups. For example, following the above comment, another candidate argued that research was about a 'question and the rigour ... and not trying to find the truth. I don't think that is possible' (Philippa). The discussion continued with Vera suggesting that 'Truth is one of the real forces or concepts of research' and Carol responding by saying 'It depends on the discipline, there are some absolute truths in technology, you don't want bridges falling down.'

There was considerable emphasis on research as a *systematic process*. For example, research means 'To look systematically, sift the chaff from the wheat' (Andrea), and 'What is meaningful, but in a systematic manner' (Mark). The description of research as *finding solutions to problems* and undertaking research so that the findings could be applied was suggested by two candidates 'having answers to questions' (Richard) and 'a description,

exploring the unknown, re-interpreting the known and then reworking for application' (Yvette).

Hence it is possible to see that the taxonomy developed by Meyer et al. (2007) has some resonance with the comments made by these 18 research candidates from different disciplines and at different stages of candidature in discussion with one another. In particular, research as an insightful process, research as finding the truth, and research as finding answers to problems.

Supervisors tended to compare research across different contexts, for example, 'Applied research is different [from straight academic research], you're trying to solve a problem and you're investigating different approaches to closing the problems' (Jack). Commenting quite strongly on the idea of research as *problem solving*, Marian suggested that, 'If it's a problem, it's a problem. Once you can do it by numbers, it's no longer a problem.'

In a different supervisor group Alex brought in the concept of *exploration within problem solving*. 'Well, I suppose it's a line of enquiry, trying to solve some sort of problem or set of issues. It's exploratory and it has to be something significant I think.' And then later in the discussion he continued:

Yes. It can be exploratory, I mean, it can be a conceptual understanding of the problem, for example, a geography thesis, the way that would differ from a planning thesis is that planning tends to arrive at policy solutions or outcomes, recommendations or improved policy, whereas a geography thesis might be more about understanding the process or coming up with a conceptualization. Planning does that, but usually the expectation is that you'll come up with some kind of policy outcome.

While Alex had raised the idea of research being *significant*, it was also discussed by a number of participants in other groups, although the notion of 'significant' did not necessarily mean 'large'. For example, Josie commented:

I would consider I'd done good research if what I did put another brick in the wall of the conversation that's continuing, if I make a significant contribution to the dialogue that's going on in my area, in my industry, that will be of value to the industry because it's advancing its understanding of how things work, but hopefully it would also be of value to the university.

The concept of a *systematic process*, as suggested by Kiley and Mullins (2005) was a frequent topic of discussion in the supervisor groups. For example, Shirley suggested that:

I would say that research is about asking questions, or having a question, a question occurring to you, and in a somewhat systematic way finding information about it, I mean, so in that sense, if we've got a question, I mean I might hunt around in my head for some answers and that could be internal research, I guess, if you like, but in research with a capital R, it's the same process, I've got a question and I'm going to,

more systematically than just looking around in my own head, I'm going to look around me with some kind of structure to my search to find information that might not necessarily answer the question but it would add information and maybe would make the question clearer.

Enid, in another group, summed up the ideas of being systematic and of significance in the following:

Well, for me, research is a systematic form of enquiry about solving problems or testing out existing wisdoms, so it could be about testing out something that's already known or is perceived as wisdom, or it could be actually solving a problem. And the idea, and I suppose in terms of research students, that there has to be some significance in doing that, so it has to be worth doing, some merit in doing it.

Discussion

It is clear from the analysis of the transcripts that a number of conceptions of research exist. First, was the conception of research being a *systematic process* as reported in previous studies. Candidates and supervisors were at one with this conception. The second was the conception of research as *finding answers to problems* as again proposed by the earlier research. The third area of similarity between the candidates and supervisors was the conception of research as *insightful process*. In terms of the supervisors, they tended to describe this as 'significant', that is, an insight that is worth having, something that answers the 'so what?' question.

Additionally, supervisors tended to talk about research as being different depending on the context and the discipline. For example, they suggested that research was part of the development of the discipline and 'what academics do'. This suggests that it is the kind of research that is undertaken in academia compared with research undertaken within the community; often referred to as 'small r' research. Hence, any future analysis would need to take account of supervisors' disciplines and experience of research and supervision as well as the stage of candidature of the students. These considerations were exemplified in the focus group transcripts where the supervisors tended to contextualize their response in terms of the discipline and the academy and yet some candidates found this level of academic 'research' constraining and frustrating, exemplified by Robert, a candidate mid-way through candidature:

I'll actually make a fairly radical statement and say that academia in some ways is its own worst enemy in terms of research. It's very systematized and very culturally constrained in terms of what it accepts or rejects as good research.

Robert's comment, along with similar comments from other candidates, suggests that he is feeling frustrated by the academy, which he suggests is too

stratified in its approach to research, and that the rules surrounding 'big R' research were constricting the creativity of researchers. However, from the supervisors' perspective, the idea that research is 'what academics do' as a way of contributing to, and strengthening the discipline implies that it is systematized and possibly even culturally constrained.

I am arguing here that what is emerging is that students early in candidature are passionate about finding an answer to a problem, even finding the truth. Over time, it is possible that they are so overwhelmed with the needs of methodology and the requirement for rigour and a framework for acceptance within the discipline that they feel stratified and un-creative. Towards the end of candidature, based on the comments in the transcripts, many of the candidates are coming out of their frustration and seeing their research being located within a systematic approach that is respected and appreciated by the discipline.

To illustrate this development it is worth addressing the metaphor of 'journey', one which came up many times in the transcripts. I would argue that 'journey' reflects the researcher's development and growth, rather than the research itself, and can be used to answer the challenge posed by Vermunt (2005) when he asked if conceptions were stable over time. Through the analysis of the transcripts it is argued that candidates who were heading toward the successful completion of their doctorate, were able to define where their research and their conception of that research sat vis-à-vis different disciplines and different contexts. On the other hand, candidates early and mid-way through candidature found it somewhat more difficult to conceive of different approaches to, and understandings of, research.

Vera, a research higher degree candidate in the first focus group, was the first in the group to describe her conception of research. She was in the very early stages of candidature and enthusiastically offered to go first in the group to describe what she thought research is:

Yes, I'll do it. Looking at discovering truth behind whatever it is that you're, you know, passionate about ... and using, as a basis, other people's research.

Interviewer: So how strong in that sort of explanation is the notion of the passion, what you're passionate about? Do you ...

Oh, yeah. That's got to be there to start with. If I wasn't passionate about what I'm doing, I wouldn't be bothered. I mean, you've got to be passionate for six years or something. Yes.

Samantha, who is more than halfway through candidature, jumped in and said:

Just thinking about the discovery, stuff around the discovery of truth, and I think I disagree with that a little bit, because I think that the truth is self defined ... you sort of embark on this type of discovery and, you know, it reflects on your theoretical orientation, the methodology that you adopt.

Yeah, like, I don't think that there is a truth to be discovered. I think that there are truths that can be discovered according to the way in which you approach the task at hand.

And suddenly Andrea, who was upgrading from a Research Masters to a PhD, joined in:

[Adopting] an absolutist approach, thinking that there is a truth, is limiting. Quite often what research very usefully does is look at an issue and develop a process by which we can perhaps almost systematically sift the chaff from the wheat if you like.

It seems that Vera was new to the research experience and has a relatively unsophisticated but very enthusiastic approach to research. It is with a tinge of sadness that I comment that Vera did not join in the discussion again from that point onwards, particularly as the comments by the more experienced candidates in the group related more and more to the notion of methodology and rigorous approaches to research.

Hence, concluding this discussion with the concept of journey, we have here an example of Vera who begins with passion and a search for the truth, the move to Samantha and Andrea (and Robert) who are bound by methodological 'rules' and approaches which both constrain and provide some comfort and boundaries, and then arrive at the concept of research being about significance and rigour. This circuitous, non-linear journey is well described by the following interchange. Philippa, relatively new to her doctoral programme suggests that:

Um, back to the beginning question about the methodology, my impression is, in the beginning I'll do some experiments, get some results, but they mightn't be that valid and as I go further down, I refine the method, and then if I want to use my old results, I have to choose, put a limit, I'll take that because it's this standard.

Sharon, toward the end of her research degree responds:

But I find even with re-writing chapters, refining my chapters I'm going right back to the beginning of what I've done and looking at my original work from like two years ago, and going, gee, I wrote that? Oh, okay. That's valid! Why didn't I see that before? So gaining that knowledge, realising then that also at the same time from being a young researcher, that you had insight but you didn't realize what you were saying, and it's only then with the knowledge that you can go back and be very critical of your own work and to be able then to draw from your own insights to bring back into this new level that you're at. So that's an interesting -

Philippa interjects: 'So you have to write all the time from the beginning.' Sharon responds: 'Yeah, oh yes.'

Hence I suggest that it may be that candidates early in candidature who are more likely to think about discovering the truth and following their

passions. During candidature it is likely that they will confuse research with research methodology and rigour and feel the straitjacket of the academy. Finally, with skilful supervision and support, it is possible that they will come back almost to where they started by being able to appreciate that attention to a systematic approach to research enables them to follow their passion and at the same time contribute in a significant and respected way to the research that their supervisors consider to be the research required by the academy. This is an argument well described in the following comment from Janice:

I just can't help but feel though that looking at things like the tools of research, like the different methods of acquiring information whatever, they're only just little sections of this big thing that's research, and, to me . . . research is, like, not one or two of those things, not whether the egg's good or bad, it's putting the whole lot together and coming up with the, you know, a conclusion, it doesn't have to be an answer, but comes to some kind of understanding. And those tools and methods are just little steps to help you on the way, and it's how you bring all the bits and pieces together that actually makes the research. The research is the whole lot, not just going out and getting numbers.

Conclusion

The study discussed in this chapter extends the research reported earlier in this chapter and suggests a number of implications for future research and for practice. It suggests that in order to understand how people think about research, we need to consider the contextual factors that have an influence on understanding. Importantly, with regard to students, it is necessary to consider the influence of the supervisor and their experience as well as the stage of candidature. While much of the literature on conceptions of research has explored people's conceptions in isolation from their institutional and personal contexts, it seems important to note that people do not develop their conceptions of research in a vacuum. This is not to say that the conceptions identified by researchers such as Bills, Brew, Kiley, Langsch, Meyer, Mullins, Shanahan, Wisker and Yijoki are not useful, but rather it appears from the research reported in this chapter that context is critical. Therefore, future research will need to take account of contextual factors that were not able to be included here. For example, it could usefully examine differences in the ways in which supervisors and students think about research in different disciplines. The findings suggest too that there is much to be gained by examining in more depth how students' views of research develop over the course of their candidatures. It would also be useful to explore different ways in which supervisors with differing lengths of service and levels of experience help students to develop their understandings of the nature of research.

So what might these findings mean for supervisor and doctoral candidate development and learning? To address the question posed at the start of this chapter, it can be important if supervisors and students have different conceptions of research. While in this study the supervisors were not necessarily supervising the particular students in the focus groups, it is clear that students and supervisors can have different conceptions of research and that these need to be negotiated and discussed in supervisory sessions. The discussion between Jack and Marian, two experienced supervisors in one of the groups, provides a useful point for stepping back and considering future developments in this area.

Marian: I think you can talk at them [candidates] till the cows come home . . . how many of those programmes have you been to with beginning PhD students where other students have told them the facts of life, but words are words, they cannot convey experience?

Jack: It comes from working.
Marian: You bet.

Hence, recognizing that candidates need to work on their research and need to be helped to see that they will develop from passionate novice through to frustrated technician, and then with skilful supervision develop into a passionate and technically sound researcher, maintaining the passion while ensuring the rigour of the research, is a clear challenge for a supervisor.

Another suggestion, which has almost become a cliché in that is it so frequently suggested, is the idea suggested by Sharon above about writing early and often. As explained by a more experienced candidate to a novice, it is through writing that a researcher can recognize the 'validity' or otherwise of their research.

While it would be possible to suggest a number of strategies perhaps the most critical factor is to suggest that supervisors need to be aware of the developmental phases of students' conceptions of research. For some candidates they might enter their degree recognizing as Janice says, that research is more than just a number of components but rather bringing together a complete picture. Other candidates will enter with passion and enthusiasm and feel thwarted and curtailed when they are asked to apply frameworks, theories and structures to their work, while others again might find that they become so bogged down in the methodological and/or technical issues that they are not in a position to see the research questions clearly. A challenge for the supervisor indeed.

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11

Learning to be a researcher: challenges for undergraduates

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The challenge of learning research

Research has become very significant in all fields of a knowledge-based society. Philippe Busquin (2001) states, in his Preface to the European Commission publication *Towards a European Research Area*, that research and development are seen as a generator of knowledge, growth, employment and social cohesion. Greer (2000) points out that the amount of information based on research and statistical analysis is growing in our society. Technical development and the increasing amount of information produced and made available by computers require the skills to handle this information in many occupations. Because of the various collection and analysis methods, the complexity of information has also substantially increased. Adequate use of a wealth of information requires that the citizens of a knowledge society develop more advanced and complex knowledge-handling skills (e.g. Bereiter and Scardamalia 1993; Murtonen and Lehtinen 2005). The ability to understand and make use of research-based information is becoming one of the key competencies of future expert practices. However, it is not only researchers who are directly dealing with research that need these skills. Experts in many other professions also need skills to understand and evaluate research-based information.

The goal of research instruction is to produce graduates capable of handling research information. Unfortunately, the outcomes of statistics and methodology courses often seem to be only the acquisition of a set of isolated facts and skills without a deeper understanding of research (e.g. Murtonen et al. 2002). Learning how to do research is one of the most important tasks at the university. It is also one of the most challenging. Students in many disciplines have reported having problems with research courses. Quantitative methods and statistics courses in particular have been noticed to cause problems in many disciplines, such as in education (Lehtinen and Rui 1995; Onwuegbuzie and Daley 1998; Murtonen and Lehtinen 2003), in psychology (Pretorius and Norman 1992; Thompson 1994; Hauff and Fogarty 1996;