

## Developing discourses of knowledge and understanding: longitudinal studies of Ph.D. supervision

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Competing notions of what a Ph.D. has been, is and should be are undercurrents in doctoral education. A longitudinal study of Ph.D. supervision based on interviews and concept mapping was used to surface understandings of the purpose of a Ph.D. This research tracks change over time for both the student and the supervisor. The data were analysed using Bernstein's horizontal and vertical discourses, describing how students can focus on 'content' knowledge aspects and miss out on key 'process' understanding. A discussion follows on how the pedagogic discourse of supervision can work towards a balance of knowledge and understanding.

**Keywords:** doctoral education; Ph.D. supervision; concept mapping; Bernstein

### Background and context

The Ph.D. is a key step in the emergence of academic status. Not only is it a 'gateway qualification' for an academic career, it is also evidence of an ability to make original and innovative contributions to a body of knowledge or technology. It is of considerable economic significance too, both to the individual who invests time and money in the research and to the wider society. Research-led discovery during or after study for a Ph.D. often leads to publication, patent registration and other activities with potential social, economic and technological benefit. However, academics (Ph.D. supervisors) and doctoral students can have different understandings of the purpose of a Ph.D. – which are often not shared and rarely discussed how they may change during the course of a Ph.D. Poor communication during a Ph.D. can lead to increased dropout rates, delayed submission and an overall poor doctoral education experience (Bengtsen 2011; Hockey 1994; Lindén 1999).

Data from the Higher Education Funding Council for England (HEFCE 2007) suggest that in reality, only 36% of full-time research council students complete on time, and that among those who are part-time and/or self-funding, completion rates can be much lower. It is therefore surprising that there is so little published research documenting the pedagogy of the Ph.D. supervision process. Despite considerable policy review in England, Wales and Scotland since 2000 (e.g. Scottish Higher Education Funding Council 2002; HEFCE 2001, 2007; HEFCW 2000a, 2000b), Barron and Zeegers (2002) remain largely justified in the observation that most researchers understand research processes through 'osmosis' rather

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than any comprehensive or research-based understanding of what it means to do research or to supervise research studies. Lovitts remarks, 'through the simple act of having faculty make explicit their implicit standards and expectations ... everyone is provided with information they need to move up a notch or two more on the road toward excellence' (2007, 50). However, we have very little data on students' understanding of the rules of engagement, particularly data tracking the simultaneous processes of cognitive change of understanding among students and supervisors in the course of research leading to a Ph.D. This is a key omission in the literature on academic supervision, and it is indicative of the general neglect for the support and development of research skills (see e.g. the Roberts Report 2002). Furthermore, even in the UK where implementation of government funding recommendations has had significant impact on Ph.D. student funding and training entitlement, support for research supervisors has improved little (Taylor 2004).

The traditional practice was to regard successful completion of a Ph.D. as an apprenticeship that then bestows eligibility to supervise others (Becher 1993). Typically, a Ph.D. thesis is expected to embody independent research carried out by the author, and through that to demonstrate that the student has located the research within a discipline or an interdisciplinary context, has shown an ability to carry out independent research as an autonomous practitioner and has made a substantial contribution to knowledge and advanced understanding.

Park (2005) reviewed doctoral education in the UK and noted key drivers for change including a new emphasis on skills and training, submission rates and quality of supervision, changes in the examination of the thesis, and the introduction of national benchmarking. Although by no means a prerequisite, it has become increasingly common to have a Master's before entering a Ph.D. programme. What is new is the demand from funding bodies and potential employers that training within Ph.D. programmes should be more structured and better coordinated, that it be broadened to embrace key or transferable skills as well as research skills, be compulsory rather than optional, and be more sensitive to issues of employability that extend beyond simply creating new academics.

### **Discourses on the purpose of a Ph.D.**

There are competing discourses in the multiple purposes of a Ph.D. described above. Here, we focus on how this manifests in the context of the supervisory relationship and in supervisors' and students' understanding of the purpose of a Ph.D. Further below, we analyse how this changes, or does not, over the duration of a Ph.D. The drivers and changes listed above pervade discourses within higher education. However, how these relate to doctoral education can be explored using Bernstein's (1990, 1999, 2000) notions of horizontal and vertical discourses.

#### **Horizontal discourse**

Bernstein uses horizontal discourses to describe everyday, common-sense knowledge, which is 'likely to be oral, local, context dependent and specific, tacit, multi-layered, and contradictory across but not within contexts' (1999, 159). A key aspect is that this form of discourse is as a cultural relay, meaning the way knowledge is shared, divided and used in specialised activities in the context of the social world. More specifically, 'A horizontal discourse entails a set of strategies which are local, segmentally organised, context specific and dependent, for maximising encounters with persons and habitats' (Bernstein 1999, 159). This can be articulated and visualised through distinct knowledge structures, following on the principles of Aristotelian logic, based on separate, discrete deductive patterns.

Horizontal knowledge structures develop as specialised languages with their own criteria and modes of circulation, with development based on the collection and accumulation of 'languages'.

### **Vertical discourse**

Rather than focusing on accumulation, as with the horizontal discourse (depicted as a linear knowledge structure), the vertical:

takes the form of a coherent, explicit and systematically principled structure, hierarchically organised, as in the sciences, or it takes the form of a series of specialised languages with specialised modes of interrogation and specialised criteria for the production and circulation of texts, as in the social sciences and humanities. (Bernstein 1999, 159)

The main feature of the vertical discourse is the integration of knowledge, not at the level of contexts but at the level of meanings. It consists of 'specialised symbolic structures of explicit knowledge' (Bernstein 1999, 161), which are integrated at increasingly abstract levels.

### **Discourses and knowledge structures**

In contrast to the Aristotelian logic of segmented discrete knowledge seen in the horizontal discourse, Bernstein's vertical discourse follows in the Hegelian tradition with the fractal architecture of knowledge structures and the more dynamic sublation of knowledge. These discourses can be explored through visualising the development of knowledge and understanding that occurs during the pedagogical process. We argue that the horizontal discourse is reflected in linear chain-like knowledge structures, whereas the vertical discourse is articulated in more complex hierarchical patterns of understanding.

In the context of doctoral education, the vertical discourse is in the context of theory development and working towards new and innovative ideas, synthesising knowledge within and beyond the discipline. Much of the horizontal discourse is in the context of the specialised disciplinary setting and can be seen in the 'content' development aspect of a thesis, the accumulation of knowledge and information. However, a conflicting discourse may arise from the 'pedagogising' (*sensu* Singh 2002) of the Ph.D., through the translation of knowledge and understanding into pedagogic communication in the supervision process. The divergence occurs where the linear, practical discourse of the thesis (e.g. 'proposal', 'drafting', 'upgrade', 'submission', 'viva', etc.) may take precedence over the vertical, conceptual discourse of the discipline under investigation. When students focus on the mechanics of producing a thesis, they may lose sight of the wider discipline. We argue that the thesis represents the point of articulation between the horizontal and vertical discourses, which has been described as the 'crucial site of the yet to be thought' (Bernstein 2000, 30). The thesis, a constant work-in-progress, provides a focus for a Ph.D. that is attempting to both add to the known body of knowledge in a discrete fashion, yet also advance understanding within the discipline through synthesising and reconceptualising the field.

The following section provides an overview of the frameworks and methodology of this study which used concept mapping to collect and track longitudinal data of Ph.D. supervision. The maps surface underlying structures of knowledge and understanding, which are the basis for the discourses described above in Bernstein's work. The maps are then analysed using the notions of the horizontal and vertical discourses.

## Theoretical and methodological frameworks

Concept mapping has been used for over a decade in higher education research (Hay, Kinchin, and Lygo-Baker 2008; Pia, Blasco-Tamarit, and Muñoz-Portero 2011). It has considerable utility for making explicit underlying knowledge structures and patterns (Craig and Lockhart 1972; Hay 2007; Maas and Leaby 2005), developing and supporting collaborative knowledge constructs (Correia 2012), and can be used to track changes over time (Kandiko and Kinchin 2012). Concept mapping (*sensu* Novak 2010) is a method of graphic organisation. Its considerable utility stems from its origins within the human constructivist epistemology, and it is now widely reported in the literature for use in the sharing of individual knowledge and understanding.

### **Concept mapping: a tool for identifying knowledge and understanding**

In 2000, Kinchin, Hay and Adams developed a modification to concept mapping analysis, proposing a qualitative approach based on gross structural morphology, leading to the classification of map structures in three categories: chains, spokes and networks (Kinchin, Hay, and Adams 2000). These three typologies are shown in Figure 1.

Recent models of learning in higher education have emphasised the emergence of ‘expert status’ as the authentic goal of university teaching (Biggs 2003; Kinchin, Cabot, and Hay 2008; Kinchin and Hay 2007; Prosser and Trigwell 1999). In this approach, the two alternative outcomes of learning (meaning-making and rote-learning) are characterised by alternative conceptual structures that can be discriminated through concept mapping. Rote-learning outcomes will be represented as simple linear chains identical (or very similar) to the linear narratives used by the teacher to describe the topic. Meaningful learning, however, will be characterised by the radical restructure and organisation of concepts, first to form simple spokes structures (learning readiness), and later to make ‘expert networks’. In the model of Kinchin and Hay (2007), the term ‘transformative learning cycle’ is used to describe the process of interaction by which students and teachers share and interrogate each others’ knowledge structures so that new meaning can emerge. Using this approach, Kinchin and Hay (2007) argue that the teacher–student distinction becomes blurred in ways that are legitimate and indeed increasingly appropriate as the student progresses through higher education, particularly at the doctoral level.

Chains and basic spoke models both fit into Bernstein’s horizontal discourse, with concepts functioning as segmented units, and increased information being brought in an accumulative fashion. Advanced spoke models and network-like structures show more integration, fitting into a vertical discourse. The latter would most strongly be emphasised by items being removed from the map as ideas are integrated. How this can happen at an indi-

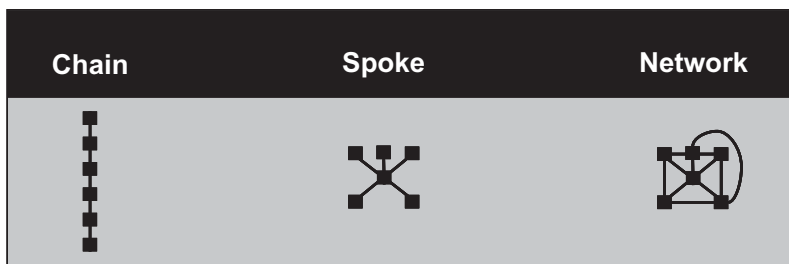


Figure 1. Concept maps comprise three basic structures (after Kinchin, Hay, and Adams 2000).

vidual level and in the course of supervision is essential to understanding how research is done and how it can be developed and sustained among emerging researchers through the supervision process.

### **Using concept mapping to surface understanding**

It is important for this research that the data illustrate patterns of cognitive change, or lack thereof, in understanding of the process of learning in a Ph.D. Furthermore, the simultaneous assessment of students and supervisors is important for understanding how the cognitive changes of one might affect the other and *vice versa*. Are these new developments? Is the change simultaneous among students and supervisors? Who leads in developing new knowledge and understanding? How is the process of student developing as researcher taught? These are important issues that are able to be addressed through the analysis of change in understanding using concept mapping in the course of a Ph.D.

We hypothesise four distinctions between student and supervisor knowledge structures before and after research. If the student and supervisor have a shared start state, the end point may also be common to both (concurrent change), or the research may be interpreted differently by either party (divergent change). Alternatively, if they have different start states, the outcome of research may be consensus (convergent change) or a persistent difference in knowledge and understanding (contrastive change). These conceptions of understanding can then be applied to longitudinal studies of the process of understanding in a Ph.D.

This differs from other investigations of Ph.D. supervision which have focused on 'satisfaction ratings'; 'power issues'; 'completion rates' or 'closeness of supervisor-student relationships', rather we are looking at possible trajectories of mutual conceptual development within the supervisory process, exhibited by students and supervisors up to the production of the thesis. This reflects Wright and Lodwick's (1989) view that for the great majority of students, the academic aspects of supervision would take precedence. In addition, this work follows students through the entire course of study in contrast to most studies that have taken a snap-shot at one point in the supervision process (e.g. Wright and Lodwick 1989).

An in-depth picture of the patterns that are evident in the ways Ph.D. students and their supervisors work together over time increases our current understanding of Ph.D. supervision and so helps in the design of materials to help novice supervisors to prepare for the process. Cullen et al. (1994, 109) concluded that 'programs for staff and students to improve practice can and should be designed to contextualise the generic processes of supervision with attention to disciplinary and usual human variation'. Such work adds a practical framework to the argument for greater attention to the personal dimension in Ph.D. supervision (Bengtson 2011).

### **Methods**

The identification of trajectories of conceptual development requires a research design that enables the lived experience of the supervisory process to be explored over time. The method chosen also needs to be congruent with our epistemological position, which relates to the legitimacy of generating data about how Ph.D. students and their supervisors develop together through the Ph.D. process by talking interactively with them. To be able to make comparisons over time, we developed a standard iterative interview procedure (see Figure 2).

Key to the design is the first interview, as the maps generated from it are used to inform the subsequent data collection. In the initial interview, the interviewee creates maps exploring

two complementary lines of enquiry (themes) about the Ph.D. topic and their conception of what a Ph.D. is, using the following questions:

- (1) Topic – looking at the academic area under investigation within the Ph.D.
- (2) Process – looking at the conceptions held of the research process and of the Ph.D. as an entity.

For subsequent interviews, the interviewee updates and modifies the two maps created, through concept map-mediated interviews, as shown in Figure 2. However, only the data on the latter question are analysed here, although the two maps created do inform each other. After the initial interview, there are two maps and a transcript of the interview. The concept maps, in addition to the transcripts, provide structure for the data, facilitating analysis within and across cases. This also helps to identify a route through the developing narrative of the Ph.D. process. Data collection and analysis occur at each stage and enable each interview to draw upon the experiences of the participants to inform theory generation relating to changes in content and processes over time.

**Sample and data analysis**

In this longitudinal research, interviews were conducted with five pairs of students and supervisors (one student had two co-supervisors, so there are eleven participants altogether), and interviews were conducted separately to minimise the interference in the supervisory relationship. Semi-structured interviews were done with the students and supervisors at four-monthly intervals. The pairs come from biological science, clinical science fields and humanities. All are from a research university in the UK. However, eight out of eleven participants in this research are from overseas and have previously studied or worked outside the UK, and there is no reason to presume that the nature of these observations would be unique to the UK. The maps shown in this paper are from three different pairs (Supervisors A and B and the Student C) and were chosen as they were broadly representative of structures that emerged from the map and interview data about the process

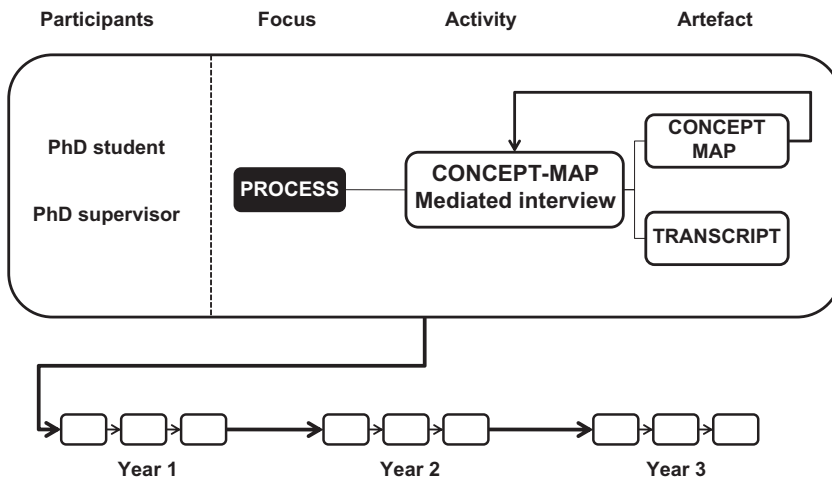


Figure 2. Study design.

and understanding of the Ph.D. Previous research (Kandiko and Kinchin 2012) reports findings comparing supervisor and student pairs. Further research will report on the interview transcript data in more detail.

The research process has generated a large volume of data that is drawn upon to inform the discussions here, although space permits the representation of just four concept maps from the total of 56 unique maps on the conception of a Ph.D., collected over 88 interviews during the four years of the study. As shown in Figure 2, each interview drew on previous maps created to develop a new map, with accompanying notes from the interview. Iterative processes of data analysis occurred throughout the study, looking at each participant's development and change (or lack thereof), comparison within supervision pairs, as well as across supervisor and student maps. As noted, we hypothesised four different patterns of change: concurrent; divergent; convergent; or contrastive, which are discussed below.

## Findings

Data indicate that students and supervisors have divergent conceptions of the research process, as drawn from the categorisations discussed above. Below are concept maps created by a student and two supervisors (all from different pairs) in response to the question, 'What is a Ph.D.?' and the conceptions held of the research process and of the Ph.D. as an entity. The first supervisor map (see Figure 3 of Supervisor A) indicates a spoke-model group of skills and attributes that influence the key relationship between the supervisor and student, with the thesis being the output that interaction. A network-like structure is seen in the layers of context that the supervisory relationship exists in, as well as the changing aspects over time and the development of the scientific process of understanding. There is a horizontal discourse of skill and attribute acquisition and accumulation, which is balanced by the multiple layers of the map, which indicate increased integration of these over time and the development of 'self-confidence and respect' as seen in the upper left-hand corner.

In contrast, below are two maps from one student. The first map was done at the beginning of the student's Ph.D. The map (see Figure 4 of Student C) breaks the Ph.D. into three chain and spoke-like streams, with the left-hand side indicating a collection of personal characteristics that need to be developed. The upper right section of the map is a semi-integrated spoke that links the work of the student, supervisor and others in the team. The bottom of the map indicates the need to keep the scope of the Ph.D. in perspective. There is the initial development of a spoke design in the set of aspects of learning to work with others, and in keeping the focus of the work-in perspective, but these are not uniquely linked to the other parts of the map, or labelled in a distinguishing fashion. There is little integration of the various parts of the map, and interestingly, the research project is central, rather than a sense of developing as a scholar or learning the processes of the discipline.

The first supervisor map (Figure 3) concentrates on traits and skills being brought into the supervisory relationship, highlighting learning as a *process* of discovery in a Ph.D., whereas the first student map (Figure 4) focuses on the research project the skills and attributes necessary to be able to complete the project. The maps also diverge in the emphasis of the output of the Ph.D. The supervisor's map very much situates the thesis as the shared output from the supervisory relationship, and the student's map centres on the project, with the supervisor a tangential part of the Ph.D. experience, not even directly linked to the Ph.D. or the research project.

The second student map (see Figure 5 of Student C) was done two years into the Ph.D. There was no great shift in conception of the Ph.D., with some accumulative skills and attributes and some minor linking of concepts. The main change is a more outward focus to the

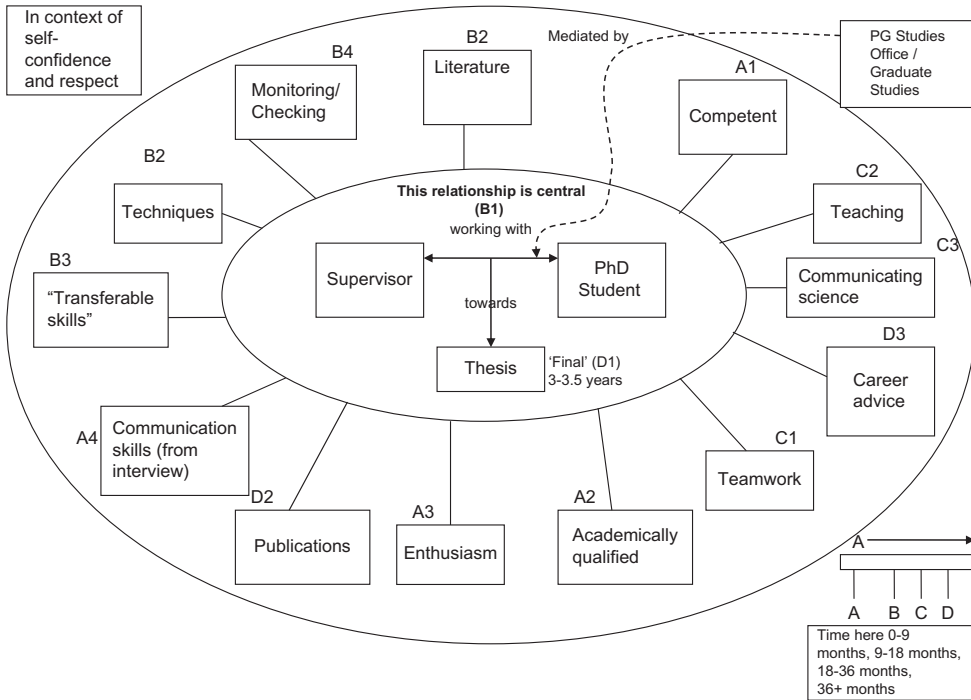


Figure 3. Supervisor A map of what a Ph.D. is.

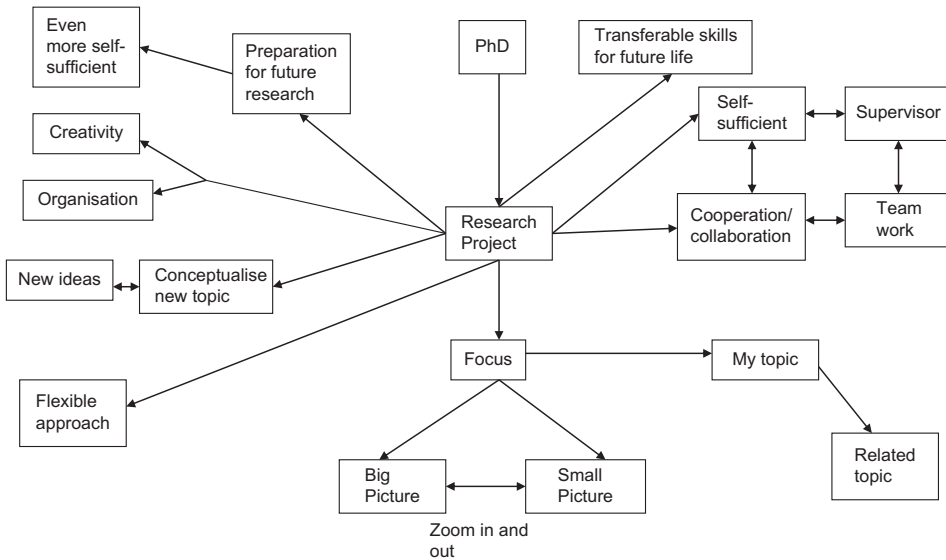


Figure 4. Initial student map of what a Ph.D. is.

Ph.D., with additions of writing, presentations, networking and conferences to the Ph.D. Over time, the maps for the supervisor and the student have remained quite stable. In both student and supervisor maps, various small elements have been added, mainly to the spokes, but the overall structure has remained the same. Following from the discussion above, this



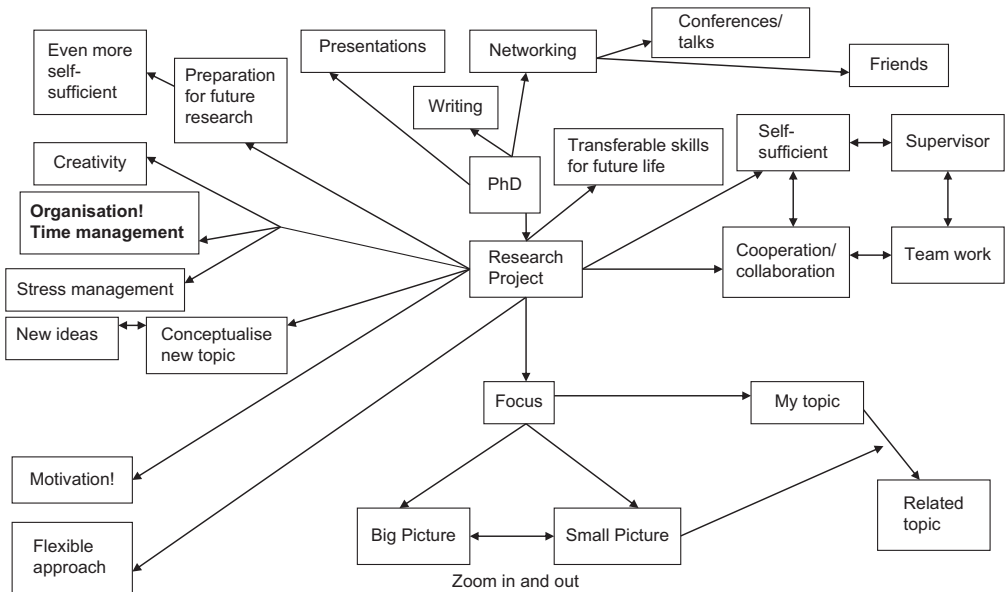


Figure 5. Year two student map of what a Ph.D. is.

appears to be closest to a case of divergent change. The supervisor positions the supervisory relationship and resulting thesis as the pinnacle of the work (he had requested a three-dimensional map with the supervisory relationship ‘above’ the rest of the map), whereas for the student, the research project is the starting point, from which all else emanates.

The divergence in the focus on research process in the supervisor and in the student map is further illustrated by another supervisor map (see Figure 6 of Supervisor B). Again,

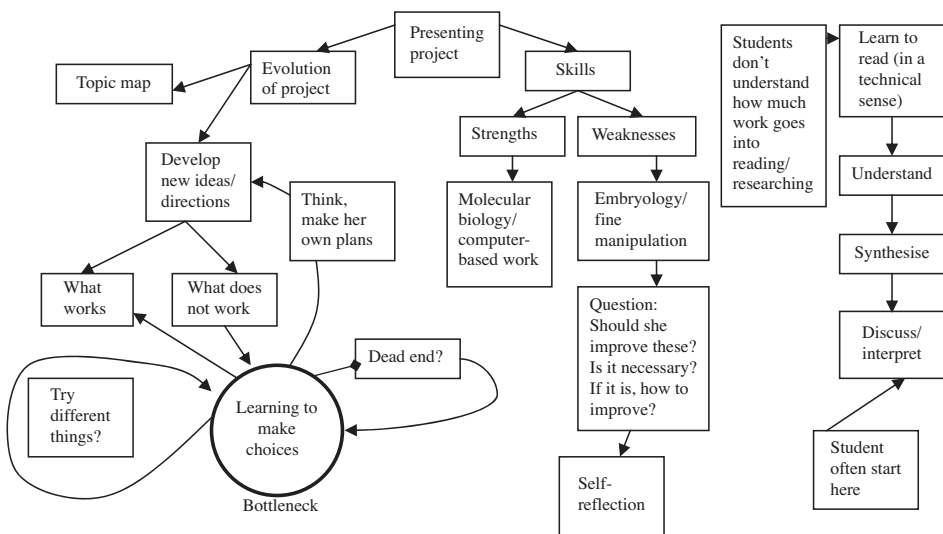


Figure 6. Second supervisor map of what a Ph.D. is.

the Supervisor B map shows the iterative process of research development in accord with the scientific process. This map contrasts with the first supervisor map in consisting of two chains on the right side of the map and a network structure on the left side (rather than the spokes and central structure seen in Figure 3). This mixture of 'meaning-making' and 'rote-learning' elements may be indicative of the more junior position of Supervisor B, compared to the more senior and experienced Supervisor A. The second supervisor map also highlights how students jump into the research development process (seen on the right-hand side of Figure 6). This indicates the role of background reading and researching in the process of researcher development, an aspect that is often given little priority by students.

## Discussion

Analysing the maps above, and drawing on data from the larger study (although not reported here), there is a tendency for students to focus on the accumulation of data and on the research project of the Ph.D. in the conceptualisation of a Ph.D. The structures in the student map indicate a more 'novice' approach to understanding the Ph.D., more in line with a horizontal discourse, albeit in a specialised context. This typical student structure is suggestive of a pedagogised version of the Ph.D. (Singh 2002), in which the discourse of 'passing' trumps any notion of contributing to the wider discipline, that is acting as a strategic student (Kneale 1997). The students' focus on the linear/horizontal would seem to embody Bernstein's notion of pedagogic discourse that 'dislocates a discourse from its substantive practice' and relocates it 'according to its own principle of selective reordering and focusing' (Bernstein 1990, 184).

The supervisors highlight the development of a process of learning and research skill development (in whichever disciplinary context) in their understanding of a Ph.D. This more 'expert' opinion is shown in the more developed spoke structures and networks seen in the supervisor maps above. The spiral-like structures and repeating cycles seem to align with a vertical discourse, working towards the integration of ideas in the wider disciplinary landscape, not just the collection of them. Supervisors see the skills and patterns established during the course of the Ph.D. as being repeated throughout an academic career. During the study, the students were focussed on completing the Ph.D., not on the Ph.D. as a process to be learnt. However, nearing the completion of their Ph.D. students began to see the Ph.D. process as a rehearsal of an academic career, which some saw themselves pursuing and others not.

Using concept mapping provides visual images of the researcher development process. The students' understanding of a Ph.D. is product-oriented, particularly about publishing and completing a thesis. This positions the thesis as an endpoint, a project to be completed, rather than as a developmental process to be learnt and begun. The student's maps are contrasted with both of the supervisors' maps, which highlight the development of the process of research and the relationship between the supervisor and student. Throughout the interviews, the supervisors highlighted how the processes of development acquired in a Ph.D. are repeated throughout an academic career. This is seen in the transition of roles through stages of an academic career, from Ph.D. student, onto post-doc position, then as junior and into senior researchers and academic posts. They see the Ph.D. as training in the discipline, rather than a utilitarian process to gain a credential or to lead to publication. A research-led pedagogy can be developed that is based on increasing understanding of the process of learning in relation to the goal of greater knowledge and theory development. This can be done alongside working towards the 'outcome' (such as a thesis or title), whilst not ignoring the broader goals of a Ph.D. This approach works towards cognitive

alignment of conceptions of what a Ph.D. is from both students' and supervisors' perspectives and works to integrate the horizontal and vertical discourses.

Concept mapping allows for the visualisation of the development process in a Ph.D. The examples shown indicate students and supervisors have divergent conceptions of the scope of a Ph.D. project and vary in conceptions of what comprises a Ph.D. Throughout the study, the maps did not seem to dramatically shift and change, particularly in the students' conception of development and the understanding of the research process. One possibility is that it takes completing the Ph.D. to be able to reflect back on process of understanding and development. It may also be that a Ph.D. is only the first stage towards developing a 'vertical discourse', and that the extended period of post-docs and junior appointments is where it develops more thoroughly. Supervisors may have more developed vertical discourses to begin with, which may explain why their maps show less structural change and more segmented, 'add-on' concepts. Supervisors may operate in a vertical discourse in terms of their field, but in a more horizontal discourse in their supervisory role. Linking the discourses could be a goal in the development of Ph.D. supervision pedagogy.

### **Summary**

This research project used concept mapping to explore change of understanding in the Ph.D. supervision process over time. This study allowed for tracking changes of the understanding of the process of the Ph.D. from both the students' and supervisors' perspectives. Concept mapping allows for visually tracking these changes over time and may also be used as a tool for supervisors and students to monitor and track the Ph.D. development process. Furthermore, this unique approach to assessing Ph.D. supervision may allow for analysis of the role of 'expert' and 'novice' status in cognitive change. This can also be a way to surface understandings of horizontal and vertical discourses and the possible influence of a pedagogised discourse that may divert the student's focus from the disciplinary discourse. Enhanced awareness of these issues may allow for the supervision process to move beyond the accumulation of knowledge and into greater integration of understanding. This research has potential benefits for Ph.D. supervision broadly, as well as the continued development and use of concept mapping in education research. Concept mapping during doctoral education can create opportunities for intervention and can work as a tool for supervisors to visually share their conceptions of research development with students and other researchers.

### **Notes on contributors**

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