Doctoral Intelligence Mechanisms to Illuminate Development Strategies in the Hidden Curriculum

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Introduction

…all this gymnastics makes you resilient and it advances your level of abstraction … the journey of the PhD makes you develop this skill.

This comment by a doctoral graduate reveals unique learning during the doctoral process. This 'advanced level of abstraction' is referred to in the conceptualisation of 'doctorateness' and reflects higher levels of thinking and quality research (Trafford & Leshem, 2008; Yazdani & Shokooh, 2018). There are increasing calls for innovative doctoral education to develop independent researchers, who produce this quality research and contribute to the society beyond the qualification (Nerad et al., 2022). Generic training programmes have been criticised as they focus on

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efficiency and the research product, sometimes at the cost of quality, and not on holistic development during the PhD (Torka, 2018). Bengtsen and McAlpine (2022) noted that supervisors were more likely to give students advice on 'how to'—on the instrumental level of development—rather than on risk-taking and finding their own voice as researchers. Elliot et al. (2020) concur and note that educational developers often guide towards the PhD product but not towards independence. We may thus ask what we can learn about the learning mechanisms that may be hidden during the doctoral process and how we foster this development based on doctoral scholars' experiences.

The aim of this chapter is to propose a doctoral intelligence (DI) framework for research independence through the hidden curriculum based on evidence of scholars' development during the doctorate. This DI framework includes hidden curriculum dimensions and principles for fostering researcher independence that could act as a dynamic anticipatory, diagnostic, and development tool to guide research development.

Doctoral Intelligence Conceptualisation

The term 'intelligence' indicates the inherent knowledge and abilities for accomplishing a task, or those mind-sets developed and employed for problem solving in a specific context (Nisbett et al., 2012; Sternberg, 2000). The development perspective of intelligence assumes that both internal and external factors contribute to intelligence (Davidson & Downing, 2000). In the doctoral context, internal factors relate to the individual's innate cognitive skills and attributes that qualify them to embark on doctoral studies. External factors refer to environmental aspects that can facilitate development of intelligence such as a range of doctoral education interventions and support. Intelligence is thus seen to be dynamic and can change as the environment changes (Nisbett et al., 2012). Sternberg further asserts that there are not defining attributes, but only characterising attributes that tend to be typical of intelligent persons. Therefore, the need for flexibility when defining intelligence for problem solving valued in a particular context (Earley et al., 2006), in the case of this chapter, defining doctoral intelligence for the doctoral context.

A cornerstone of innovative doctoral education could be to enhance mind-sets necessary to promote doctorateness. DI has been conceptualised to indicate the 'knowing', 'doing', 'thinking', and 'willing' mind-sets

Textbox 1: *DI domains*

Knowing:	Foundational expertise in discipline and research
Doing:	Application in practice of research for the PhD product
Thinking:	Higher level mental processing for quality doctoral work
Willing:	Open-minded for continuing development

(Textbox 1) for completing the doctorate based on an analogous link to cultural intelligence (see Albertyn, 2021; Earley et al., 2006).

The focus of DI is thus on conceptualisation of characterising mind-sets and not on the multiple competencies reported by Durette et al. (2016), for example. Mowbray and Halse (2010) believe that such lists of competencies may be daunting. Therefore, a focus on broad mind-sets could lighten the cognitive burden and enlighten doctoral scholars about expectations in a way that is empowering. This chapter builds on earlier DI conceptualisation and empirical work reporting evidence of the four domains but focuses specifically on hidden DI domains and principles identified that could guide doctoral pedagogy.

Doctoral Intelligence Manifestations Reflect Mechanisms for Dynamic Development

Experiences of doctoral education were explored during interviews with questions related to the DI domains of 'knowing', 'doing', 'thinking', and 'willing'. Purposive sampling was applied to select twenty-two doctoral scholars from three PhD programmes (Development finance, Futures studies, and Business management and administration) at four stages of studies (proposal, implementation, concluding, and graduated). Selective evidence from findings reflects hidden curriculum DI manifestations and mechanisms and culminate in a DI framework to guide development efforts.

Doctoral Intelligence Manifestations

Manifestations of the four DI domains lead to a clearer understanding of mechanisms that lead to independence during the learning process.

Knowing

It would be expected that scholars have expert knowledge of their disciplinary field and of research method in pursuit of this PhD qualification—referred to as 'grasp' by Holbrook et al. (2015). Analysis revealed other 'knowing' aspects in the hidden curriculum related to embracing depth of knowledge in the PhD process that leads to novelty: 'That drive to really understand things deeply… the PhD gave me the tools and confidence to do that in a different way… connecting the dots and understanding the relationships'.

There is evidence of knowing as a process but also as a basis for lifelong learning. Beyond knowledge required for the PhD product, personal value and acknowledging the contribution to society were noted:

> It is adding tremendous value to my life… I am learning a lot about the discipline… I am learning about myself
>
> … being comfortable with engaging with those different fields and… find a way for all of those fields to live within my study and then a lot deeper and it feels a lot more responsible in terms of that whatever you are saying here, it better be meaningful.

Another participant noted self-knowledge: 'I have to teach myself how to learn this myself'. These comments reflect the alternative types of knowing that are hidden during the process while learning for independence during the PhD.

Doing

The application phase is essential for completing the PhD research product; but the additional benefits relate to the confidence obtained through learning by doing. Their independence needs to be demonstrated through informed research decision making for application that provides them with validation (Ashforth & Schinoff, 2016). Thus, elements of ownership and agency develop through doing the work required to attain the PhD:

> you had to create your own authentic structure and if it is not genuine, it will show, people will pick up … company[ies] want people like that, people who can work by themselves. … You can think, process, and create more. … They like people who can solve problems.

Doing PhD research creates an impetus for learning with reciprocal benefits on the product and identity development and independence for the doctorate and beyond the qualification.

Thinking

The thinking domain reflects higher-order mental processes and level of cognitive functioning (Davidson & Downing, 2000). This domain is often a more challenging part of the doctorate (Trafford & Leshem, 2008). Aligned with literature that refers to critical and creative thinking as being crucial in doctoral education (Brodin & Frick, 2011; Hodgson, 2020), scholars in this study also referred to independence in thinking and being able to crisply communicate thinking. As indicated by one participant: 'I actually loved that … it is for me to decide … I need to take full responsibility and control of that thought process'. As participants were mainly mature part-time scholars, they reported using divergent and convergent thinking problem solving tools they use in the workplace. Value was found in diverse activities, such as interactions with others in the workplace or in colloquia where their thinking was challenged or affirmed. This development built confidence and depth and contributed to the quality of the PhD, leading to independence and formation of their research identities.

Willing

The willing mind-set seems to be foundational throughout the doctoral journey. It also develops through the process of learning. This mind-set is reflected by one graduate: 'you are very angry and depressed, but that ability to come back and try to see what is the point here … it is humility. You have to be humble.' Aligned with the attributes of intellectual virtues proposed by Ortwein (2015), participants identified the following mind-sets: responsibility, purpose, curiosity, being open-minded, love of learning, humility, excellence, mental maturity, and wisdom. They indicated that, in addition to motivation, there needs to be greater purpose or value to drive the continual process of development and prevent scholars from giving up: 'if there is some sort of an external contribution. If you have it, you do not even see it as a really long journey. … The iterative nature and various nuances of the doctoral process harness this development and sustain the learning process for quality products valuable in society'.

Doctoral Intelligence Mechanisms

Three DI mechanisms reveal principles that could guide the hidden curriculum, namely, embracing the learning during the doctoral process, encouraging strategies for ownership and independence, and harnessing integrated DI domains as part of a dynamic iterative process for development towards independence.

Learning During the Doctoral Process

> you are building up, building up. … Steadily climbing steps. It is like Great Wall of China. … You cannot go quicker. … So, I find that I am more deliberate … you are thinking in a more consistent pattern.

This comment about learning due to the doctoral process was mentioned by others also who referred to the environment 'pushing' scholars due to expectations by the context, the nature, and outcomes of the qualification and by society. This process is not always pleasant and forces reflection and deeper engagement: 'a lot of circling around in my mind'. These scholars refer to being 'rigorous with themselves' due to evidence needed to give 'surgical sharpness' to arguments. Higher levels of abstraction were developed due to the continual iterative exploration in research itself facilitating this learning rather than abstraction being 'taught'. Graduates indicated how the PhD prepared them for problem solving in the world in general and the continued curiosity and engagement after qualification indicating skill retention.

One comment, 'At the beginning I was very confused. I am now less confused. Not unconfused yet', reflects this scholar making peace with this process of learning. Thus, scholars need to gain insight into the nature and value of learning as a trajectory of development during the doctoral process without over-focusing on progression towards the PhD product. This principle reflects the integration of the DI domains and reveals the hidden curriculum dimensions beyond disciplinary and research knowledge and application.

Strategies for Ownership and Independence

The reported strategies scholars employed reveal their independence and agency (see Table 1).

Table 1 Hidden strategies for development towards research independence

Structure	Putting systems in place for accountability; to identify tools and resources; to simplify and understand the essence first by breaking things 'down in chunks'
Alignment	Continual checking of alignment and the golden thread by keeping the research question central, to avoid getting side-tracked: 'if you engage with it continuously, you start connecting things'
Brainstorming	Talking to others to 'test the waters' and listening to others to get ideas. Mind-mapping/relevance tree/drawing of conceptual maps to connect the dots and seeing things from a different perspective. Keeping a researcher notebook for ideas as they arise
Distancing	Take a break, sleeping it off, slowing down the mind by being active [walking, swimming, or cycling]. Benchmarking, wide reading: 'and then a lot of stepping away and then just say, okay, let us just render this for a while'. As another participant noted: 'Rather down tools and not sit and mope and muddle, because while I am not here, the brain is working'
Distillation	The summarising and draft-upon-draft process helps with filtering to focus. 'Be comfortable with deleting'. Another tool mentioned was the three-minute speech. One person referred to simplicity through drawing and 'drilling down' into the key concepts
Personal investment	Self-talk, self-management, and ownership: 'You need to really interrogate issues on your own.' Believing in the larger purpose and responsibility to society was indicated, such as: 'how can I make a difference?' and 'to always have that appetite of resolving complex problems in society'

These six strategies reveal the hidden learning that takes place during the doctorate and reflects the integrations with the other DI domains. These strategies could act as a guide for research development towards independence. Scholars bring their own unique skills to the educational process and encouraging them to use these contributes to confidence, identify development, empowerment, and independence.

Integrating DI Domains Enhances Development

The mind-sets for success seem to be integrated during continuing learning in both the formal and hidden curriculum. (See also Elliot's chapter exploring the role of mind-set in enabling doctoral scholars to appreciate the value embedded in their experience.) The 'willing' DI domain seems to be a foundational domain infused throughout the PhD and a necessary

mind-set for an incremental development (Wang et al., 2019). The attribute of intellectual humility within the willing domain seems to be crucial. Intellectual humility involves a realistic appraisal of strengths and weaknesses (Haggard et al., 2018) and has been linked to cognitive flexibility (Zmigrod et al., 2019), open-mindedness (Porter & Schumann, 2018), and wisdom (Wang et al., 2019). Principles related to learning through the process, ownership, independence, and integrating DI domains could foster dynamic development efforts towards researcher independence.

Hidden Curriculum Guiding Framework for Research Independence

Based on examples of hidden curriculum manifestations and mechanisms, the proposed DI framework could foster research independence development (see Fig. 1).

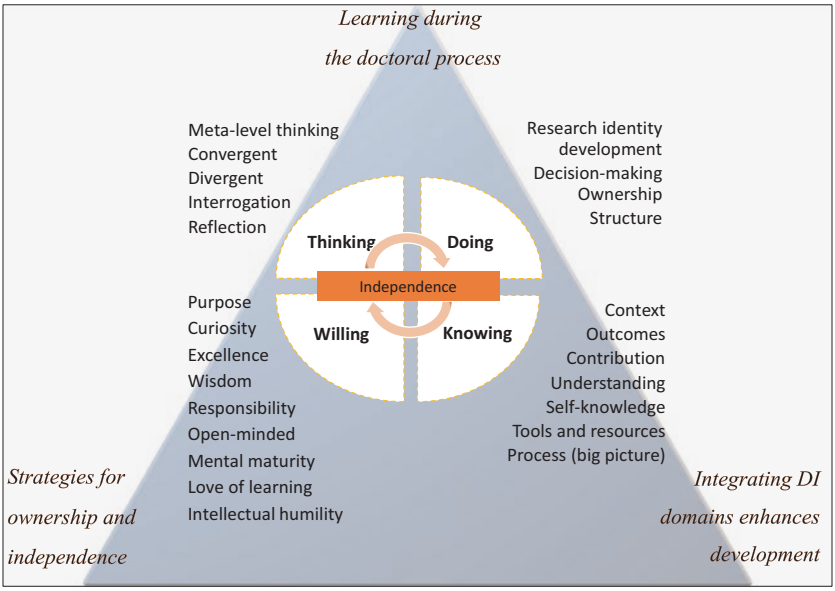

Fig. 1 DI framework for research independence through the hidden curriculum

This framework provides an overview of the manifestations of the hidden curriculum within the four DI domains and the three identified principles or mechanisms for development. Although the 'knowing' and 'doing' domains are traditionally focused on informal education programmes, this study revealed hidden indicators within these domains that influence development during the doctorate. These doctoral mindsets do not develop linearly and cannot be addressed with one-time training or tracked using competency checklists. Researcher independence is a dynamic process that develops iteratively over time.

Conclusion

There seems to be evidence that the DI mind-sets are not neatly packaged into a sequential set of steps that can be covered in formal educational programmes. The DI mind-sets evident in the hidden curriculum provide insights into pertinent mechanisms and principles that could influence thinking and action in doctoral pedagogy for continual research development infused in supervision, education, and support.

The DI Framework for Research Independence through the hidden curriculum provides a map of the doctoral terrain and could act as an anticipatory system reflecting dynamic mind-sets (Slaughter, 2008). In this holistic view of DI, the mind-sets present in one domain may influence the mind-sets in the other. This framework may also act as a diagnostic tool for discerning where one aspect is dominating other domains (Wilber, 2005). Due to the reciprocal relationship between domains, thoughtful strategies to ensure development of each domain could enhance development in the other domains. This meta-perspective of mind-sets provides guidance for pedagogical approaches for facilitating researcher independence during the doctorate and thereafter.

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