Chapter 5
Postformal Learning for Postnormal Times

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Abstract  It is said that we live in ‘postnormal’ times, characterized by heightened interconnectivity, complexity, chaos, and contradictions, and perhaps most acutely exemplified by the current climate crisis. A reliance on the ‘normal’ ways of thinking, being, and working are largely responsible for the state we are in, and a reorientation and expansion of our ways is essential if we are to mitigate the upcoming catastrophes and move towards a more life-affirming future. We will need our graduates to manifest greater capacities for holistic, multi-perspectival, flexible, creative, and empathic understanding; they will need to be able to know in different ways, and be effective change agents in a diversity of settings. This chapter describes possibilities for and models of doctoral education that revisit its purposes and priorities towards these ends. In particular, it is argued that the parameters of dissertation research—the core component of student learning—should be broad enough to allow students to develop these attributes and that more student-centric, transformative, approaches to doctoral education are necessary. Initiatives at the University of British Columbia that promote and support these ideals have demonstrated their viability across most disciplines, and similar goals are broadly supported by a vast majority of surveyed graduate schools across the country.

The reductionist, analytical world-view which divides systems into ever smaller elements, studied by ever more esoteric specialties, is being replaced by a systemic, synthetic and humanistic approach. The old dichotomies of facts and values, and of knowledge and ignorance, are being transcended...The science appropriate to this new condition [postnormal science] will be based on the assumptions of unpredictability, incomplete control, and a plurality of legitimate perspectives. (Funtowicz and Ravetz 1995)

I am not an environmental scientist, nor a social scientist or philosopher. I am writing as a practitioner of graduate education administration (and former molecular geneticist) who cares deeply about the future of the world, the future of the
academy, and the futures of our graduates. I and my colleagues thus represent key contributors to the ‘plurality of perspectives’ required to navigate this very messy but urgent topic of how doctoral education and research can help heal and transform our world, mitigate our upcoming catastrophe(s), and redefine the interrelationships of all living things.

The climate crisis, the changing geopolitical landscape, our increasing global inequalities, and the COVID-19 pandemic are all emblematic of what has been called our ‘postnormal’ time, characterized by uncertainty, interconnectivity, complexity, chaos, and the prevalence of contradictory perspectives and values (Sardar 2010, 2015). The assumptions, conventions, and rules modern society has relied upon in life, in politics, and in science and scholarship of the past decades are in many ways inadequate to understand or cope with the uncertainties and complexities inherent in the increasingly urgent problems of our globalized, industrial world. In fact, as many have noted, it is these conventional scientific and societal worldviews and practices—responsible for the successes of technology, medicine, wealth production, and colonial expansion—that have in many ways caused or contributed to the catastrophes of our day. We are in an in-between period, Ziauddin Sardar has said, where ‘old orthodoxies are dying, new ones have yet to be born, and very few things seem to make sense’ (Sardar 2010).

The single lenses of reductive, disciplinary sciences and their underlying ‘taken for granted logics’, including binary cause-and-effect reasoning, context-independent generalizations, and formal, linear thinking (even if these are not always subconsciously adhered to) continue to be fruitful approaches for many questions. Using only these to the exclusion of other modes of thought, however, is wholly inadequate in addressing the profoundly complex and interdependent dimensions of much of our twenty-first-century world. First described in the 1990s, an emerging ‘postnormal science’ is a response to this gap (Funtowicz and Ravetz 1995). This approach to scholarship relies on ‘the recognition of different legitimate perspectives and ways of knowing…more akin to the workings of a democratic society, characterized by extensive participation and…and diversity’ (Funtowicz and Ravetz 1995, p. 160). Here, an ‘extended peer community’ is essential for quality assurance—quality not only of the products of research, but of its processes, people, and purposes. The diverse perspectives need to stem from inclusion of those from outside the usual domain of sciences and the academy and to encompass both the head and the heart in much broader capacities than those traditionally acceptable in the academy. This is not an argument for wholesale dismissal of enlightenment-inspired values, but rather an abandonment and ‘unlearning’ of some of its ‘fundamentalist’ notions (Elkana 2000) and a learning of more capacious approaches to understanding.

This expanded view of contemporary scholarship has some parallels with many aspects of ‘Mode 2’ research and knowledge mobilization (Gibbons et al. 1994), increasingly practised in the academy, and typified by a wide range of actors inside and outside the academy working collaboratively and iteratively on problems in their context. Such contextualization allows a shift from solely scientifically ‘reliable’ knowledge to knowledge that is also ‘socially robust’, the validity of which is determined by a wide community of users and contributors (Nowotny et al. 2003).
Uncertainty, complexity, and volatility are not limited to grand, wicked problems. Massive interconnectivity, a key underlying characteristic and cause of post-normal environments is just as prevalent in and relevant to institutions and organizations (Anderson and Jefferson 2019; Sargut and McGrath 2011), governance (Serra 2019), and societal patterns, including those of the evolving landscape of work (Ramanathan 2017). PhD graduates, wherever their careers take them, will need the ability to wisely and productively navigate complexity, uncertainty, and volatility. These issues are also linked to individual wellbeing, clearly a twenty-first-century concern for doctoral students and graduates. An uncertain and volatile world can generate anxiety, feelings of powerlessness and insecurity (Sardar 2010); moving beyond binary thinking and assumptions of order and logic in life can support resilience, and provide the confidence to cope with chaos, complexity and contradiction in life as much as in work and research (Gidley 2010; Scott-Janda and Karakok 2016).

Postformal Thinking and Wisdom

Personal abilities and attributes enabling us to navigate our way through the challenges of postnormal times have been proposed by many and are remarkably consistent (e.g., Gidley 2010; Olvitt 2017; OECD 2018; National Academies of Sciences, Engineering, and Medicine 2018; Winter-Simat et al. 2017; Partnership for 21st Century Skills 2008). Perhaps most fundamentally, we need flexibility in ways of thinking and knowing, and the motivation and ability to seek, understand and integrate the required plurality of perspectives. We need a better ability to understand and contextualize our work, and, especially for the future of our planet, ‘a deep reflexivity of [the Earth’s] inhabitants finally learning where they inhabit’ (Latour forthcoming). We need various higher order thinking abilities that may be categorized as ‘postformal’ (for review, see Gidley 2016a). This term references Jean Piaget’s proposed last stage of human cognitive development, ‘formal operational’ thinking, which enables thinkers to reason well within a formal, structured system. In these postnormal times, the necessary thinking processes also include ones that are more creative, reflexive, intuitive, relativistic, systems-oriented, and dialectical (in which issues are approached from multiple perspectives or logics). These thinking processes have also been conceptualized as a ‘higher order of consciousness that involves changes in epistemology and ways of making meaning more inclusive, integrative, and complex’ (Stevens-Long et al. 2012) and are frequently aligned with the concept of wisdom (e.g. Arlin 1999; Sinnott 1998; Sterling 2003; Sternberg 2001).

The epistemic plurality required of today’s scholars is especially important in advancing reconciliation between Indigenous and settler peoples, and in reversing the assimilation and cognitive injustice perpetrated through the privileging of Western epistemologies in our broader scholarship (Kuokkanen 2007; Santos 2007). Crucially, the academy as a whole is also impoverished when it marginalizes the legitimacy of Indigenous ways of knowing:
As long as the academy remains ignorant or dismissive of epistemes that differ from dominant Western ones, Indigenous people will be voiceless – in the sense that their words will be misunderstood or ignored – and furthermore, the epistemological foundations of the academy will continue to be constrained as well as exclusionary. As long as the academy sanctions epistemic ignorance, it will be unable to profess its multiple truths...It is not simply what the academy can do for Indigenous peoples; it is also what the academy needs to do for itself. (Kuokkanen 2007, p. 5)

These types of thinking could also be described (in a perhaps reductive fashion, ironically) as ‘whole-brained’ approaches to experiencing and understanding the world. As comprehensively described by Iain McGilchrist (2009) from a wealth of evidence, our two brain hemispheres attend to and represent the world in different ways, both of which are necessary. The left hemisphere relies on sharp focus and a narrow perception of things as decontextualized, static, abstract, mechanical, and fragmentary. It prioritizes theory over experience and creates a model of the world that ‘aims’ towards certainty and allows prediction. It is unaware of its limitations. The right hemisphere, on the other hand, attends to the world holistically, relies more on tacit understanding, and is more open and uncommitted to what it may find. Meaning beyond language is understood, ambiguity is accepted, and the world represented is a ‘live, complex, embodied, world of individual, unique beings, forever in flux, a net of interdependencies, forming and reforming wholes, a world with which we are deeply connected’ (McGilchrist 2011). A link with these ‘right-brained’ concepts of thinking and feeling has frequently been made with the development of sustainability mindsets (Haines 2017; Rimanoczy 2013; Livingstone 2018) and to wisdom.

As our graduates advance understanding in all forms of work, they will also need a ‘bias toward action’ and a design-thinking frame of mind (e.g., Buchanan 1992; Carroll 2015) if their work is to have impact. ‘Normal’ notions of scholarly objectivity and detachment in many fields, while necessary to address structured, scientific problems, are insufficient for innovative solution-finding that also relies on abductive reasoning, creativity, empathy, and divergent thinking.

Our Current State and Potential for Improvement

Doctoral research and related coursework in many areas can engage students in these more complex, cross-boundary, and epistemologically diverse cognitive processes; however, neither most disciplinary graduate programs and research projects provide the opportunity to do so nor are students usually assessed for these abilities. Robert Sternberg’s (2001) notions of multiple intelligences encompass at least a subset of these postformal abilities, including creativity, the ability to hold multiple perspectives in mind, and intuitive, or practical, wisdom (Gidley 2016b). In broad surveys of faculty members’ views of these broader intelligences in doctoral students, Barbara Lovitts found that few students were perceived as exhibiting these in
a profound way, and few dissertations reflected those qualities (Lovitts 2007, 2008). While we are unaware of research more directly assessing the prevalence of postformal thinking abilities among doctoral students, it has been estimated that fewer than 0.05% of the American population has these abilities at the third of four proposed levels (Commons and Ross 2008).

Over the past decade, employers of recent PhD graduates have fairly consistently noted that new hires often struggle to work effectively with those from diverse cultural or disciplinary backgrounds, may be confounded by ‘real-world’ problems or situations, and are not as flexible as they need to be (Borrell-Damian et al. 2015; EURAXIND 2016; Porter 2017). ‘Broad literacy’ across diverse disciplines has been specifically cited as an attribute that needed better inculcation in doctoral students to address the increasingly complex problems that employers are engaged in (NASEM 2018).

While many of these abilities are often subsumed under the category of ‘soft skills’ or even ‘non-cognitive skills’, they have very significant cognitive dimensions, in addition to affective and conative (motivational) ones. They impact not only practical performance in a work environment, but how individuals approach significant, intellectually demanding challenges, and how motivated and effective they are at leadership and eliciting meaningful change.

Learning postformal thinking patterns and ways of being is by definition a holistic endeavour, entailing growth in emotional domains, interpersonal competencies, creativity, and personal attributes such as empathy and humility (Baxter Magolda 2007; Griffin et al. 2009; Scott Janda and Karakok 2016; Sinnott 2002; Stevens-Long et al. 2012). They cannot be learned through ‘normal’ educational paradigms that value independence and fragmentation, but require transformative learning approaches (Illeris 2014; Mezirow 1991; Taylor et al. 2012) that incorporate experience, disorientation, dialogue, and reflection, ultimately causing a ‘deep structural shift in the basic premises of thought, feelings and actions’ (Centre for Transformative Learning, University of Toronto n.d.). Learning to become a scholar for postnormal times requires doing such scholarship.

There are obvious obstacles to this in doctoral education, a primary one—in the sciences—being the apprenticeship paradigm, that relies on students as labour on faculty research projects. While postnormal forms of research are increasingly prevalent in some areas, they are still rare in others, and students do not widely have the opportunity to explore this mode. Across all disciplines, there are perhaps equally problematic cultural barriers of faculty and student research reward systems, that value independence, clear conclusions, traditional academic modes of communication, and disciplinary advancement, and that depend exclusively on ‘expert’ peer communities for assessment of quality. Among still other barriers are the issues of program completion times—postnormal science is slow (Stengers 2018)—and concerns about academic career trajectories for students who have veered off the traditional paths of scholarly work.
University of British Columbia Experiment: The Public Scholars Initiative

Despite (or because of) these hurdles, the University of British Columbia (UBC) embarked on an ambitious experiment in 2013 to ‘reimagine’ the potential of the PhD in light of the complexity and urgency of the world’s problems, in the diversity of doctoral career pathways, and in the evolving relationship of the university with society (Porter and Phelps 2014; Peker et al. 2017). While extracurricular professional development opportunities, including internships, had been offered to doctoral students for over a decade, the time had come, we believed, to also explore more integral changes across all disciplines and to rethink and re-articulate the purpose(s) of a PhD, facilitating an expansion of the ways students think, act, feel, and learn through their scholarship.

Drawing from the work and language of the Carnegie Initiative on the Doctorate (Walker et al. 2008), we proposed that doctoral education should entail the ‘formation of scholars who make a positive difference in the world’. ‘Formation’ is seen as close to the German ideal of ‘bildung’, which aims towards the development and harmonization of the mind and heart—one’s humanity—towards personal maturity and contribution to and transformation of one’s society. As described in Walker et al. (2008), ‘scholar’ also has a broad meaning, extending beyond the academician to all those relying on specialized knowledge and a ‘larger set of obligations and commitments that are not only intellectual but moral’ (p. 4). The work of the scholar writ large, then, entails all of the domains of academic scholarship the American educator Ernest Boyer (1990) termed as discovery, application, and integration of knowledge, and its transmission through teaching and learning.

Many doctoral graduates will need to transform knowledge into action and change through numerous avenues that include policy, entrepreneurship, communication, and institutional and societal change; many will need to integrate information and ideas from diverse sources to serve causes or stakeholders; many will be teachers in a variety of contexts; and most will need postformal ways of thinking and being. We explicitly challenged the assumption that such ways of doing scholarly work were inappropriately included in doctoral learning objectives and assessment (a sentiment more prevalent in some disciplines than others), and argued that such broader abilities and mindsets can be learned best, or only, through transformational approaches integral to students’ primary intellectual development. The development of such abilities should not be seen as an ‘add-on’ to doctoral education, but as necessary to the formation of graduates in the twenty-first century and therefore assessed as part of the degree.

The first initiative from the central graduate school, launched in 2015, was an ‘experiment’ to determine whether a larger conception of doctoral research and scholarship beyond most academic and disciplinary norms was feasible in the academy, and whether faculty were willing to accept and assess corresponding dissertations that may be broadened in content and/or format. The goals of the pilot were to facilitate the development of students who were able to make a purposeful, ‘positive difference in the world’ through effective scholarly work in diverse contexts,
through engaging a plurality of perspectives and partners, through approaching messy questions or problems with wisdom, through knowing and communicating in different ways, and through competence in creating diverse forms of scholarly products essential to the work of the scholarship. We also wanted students to gain experience in and awareness of potential career pathways. The intention was for students to expand their dissertation research in more postformal ways, outside the norms of their discipline, and for the work to be included in their dissertation.

The resulting ‘Public Scholars Initiative’, or PSI, is now in its sixth year (University of British Columbia n.d.-a). The program invites applications from PhD students in all disciplines, with the support of their supervisors and research partners as applicable, to describe their proposed dissertation work that meets the goals of ‘explicitly linking doctoral work to an arena of public benefit and integrating broader and more career-relevant forms of scholarship’ into their doctoral education. Successful applicants are provided up to $20,000 over two years as a research allowance and/or stipend. The initiative also includes programmatic elements such as panel discussions and workshops on areas of interest and relevance, a required presentation to the broader public, opportunities for interdisciplinary peer engagement and community-building, and mentorship and support on academic issues. Students are profiled on the PSI website, and through this and other means, are frequently invited to speak or be interviewed by parties within and outside the university.

From more than 400 individual applicants over five years (approximately 8% of the university’s eligible doctoral student population, that is those in years 1–4), 184 students have been selected to participate, studying in all major disciplines at the university, including the humanities, sciences, applied sciences, health sciences, and social sciences. They are collaborating, or have collaborated, with over 100 partners in all sectors in more than 40 countries. More than 40 have graduated, and are working in diverse careers throughout the academy, and in the public, private, and nonprofit sectors.

The following two stories of PSI scholars and their dissertation work illustrate the incorporation of both postformal forms of thinking (including multiperspectivality, contextualization, creativity, systems theory, and tacit reasoning) and extended peer collaborative communities with contradictory perspectives and values:

- Having worked in the area of childbirth support, interdisciplinary studies student Sarah Munro sought to understand the reasons for, and help reduce the rates of, unnecessary caesarean section births for women who had previously delivered through C-sections (Munro 2016). Findings from interviews of the various stakeholder groups (expectant women, clinicians, and hospital administrators), interpreted through complex adaptive systems theory, showed disparities in perspectives, needs, values, instincts, and knowledge bases between the groups, which contributed to sub-optimal decision making. Using an integrated knowledge translation approach, she collaborated with the groups and the provincial government to facilitate improved mutual understanding among them and to devise policies to improve future practices. A jointly written policy brief and a
scholarly description of its development were included in the dissertation. Most of the recommendations in the brief have since been implemented by the collaborating health authority.

- Driven by a concern about the fraught and contradictory discourse in humanitarian disaster recovery, an area in which he had previously worked, educational studies student Omer Aijazi engaged with residents in Northern Pakistan and Kashmir along with local organizations to understand the ‘micro processes’ through which the residents recover and flourish after natural disasters. As he engaged with the residents, he described ‘throwing out’ his interview questions and ‘discarding’ his carefully honed research proposal as the conversations revealed a much greater complexity of residents’ experience than he had anticipated, one characterized by a profound interconnectedness with multiple forms of violence (including epistemic harms) beyond that of natural disasters. He decided to center his dissertation on a series of ‘scenes’ interspersed by images and poetry, which he described as an ‘experiment with form and content to adequately accommodate complexity, nonlinearity, ambiguity, and the openness of life.’ (Aijazi 2018). He has contributed substantially, both before and after his PhD, to international policy development and public dissemination in addition to the scholarly literature.

For some students participating in the PSI, the supported work was already planned or considered; PSI funding either provided needed resources or allowed a slight pivoting of the research towards the goals of the PSI. For others, it provided resources to mobilize the research or to expand the range of or degree of interaction with collaborators. For others, it was an entirely new approach to the dissertation research question or to the general area of study. This latter group included an English student studying writing who worked collaboratively to create a related interactive computer program; a botanist who included as a chapter in his dissertation a scholarly reflection and proposal related to what he saw as a misalignment of his discipline’s current directions with the urgent needs of the planet (based in part on his PSI-funded work with the provincial government); a biomedical scientist who is collaborating with patient groups and clinicians to assess their concerns about and willingness to use novel therapeutics that he helped develop; and a zoologist and botanist who included in their respective science-based dissertations a chapter on the development and assessment of undergraduate teaching methodologies in their areas of study.

Identity, Legitimization, Successes, and Failures

For us, one of the most surprising findings from the initiative was how deeply meaningful the legitimization of students’ identities and work was for many. If a defining feature of Millennials is ‘pragmatic idealism’ (Burstein 2013), this has certainly born true with the PSI scholars, most of whom fall in this demographic. Through
conversations and an annual survey,\(^1\) many expressed a disappointment with the academic milieu which they felt seemed to devalue their expertise, creativity, passions, and orientation as change agents, and in which they felt restricted in their research questions and approaches by the unquestioned epistemic norms of their disciplines, including detachment and decontextualization. Some said they had finally found an academic ‘home’ or a ‘life-line’ in the PSI, and were in fact re-invigorated to pursue an academic career, knowing what may be possible in the academy (‘Before [being in the PSI], I could not see myself as an academic, and now I see a path that motivates me to continue my studies’; ‘it has helped me take ownership over an academic identity that I already had, but was shy or reluctant to admit, previously’). It was massive relief to many to discover that their boundary-pushing and solution-oriented approaches to research questions can be fully endorsed by the academy.

Among those who hadn’t necessarily viewed themselves as public scholars, the PSI-enabled work awakened many to this new possibility, and unexpectedly helped shape their growing identities. Over 85% of all surveyed students agreed with the statement that the PSI ‘significantly impacted [their] formation and identity as a scholar’:

- ‘It gave me an opportunity to even begin to imagine that my research might have impacts outside of the walls of academia’.
- ‘I began to frame my work as public work, and to understand the role of my work in pushing forward public knowledge and practices’.
- ‘It has made me think more critically about my responsibilities as a researcher’.
- ‘Largely because of PSI, I will continue to pursue avenues to research for the public good’.

Although students’ supervisors were supportive of the work itself (it is a PSI application requirement) many, particularly in the earlier days of the initiative, did not agree that the ‘PSI component’, as some thought of it, was appropriate dissertation material. It was sometimes viewed as improperly outside the disciplinary norms or as not scholarly; or it was considered perhaps worthy but impossible to be assessed. It was frequently up to students to persuade their supervisors or committees of its legitimacy, and they had variable degrees of success in doing so.

- ‘Despite the fact that I have changed policy in the government over the course of my degree, it will be unlikely to end up in my dissertation (as I come from a hard-core empirical-based discipline; thus, policy changes are irrelevant)’.
- ‘To go beyond these ‘traditional’ pieces of scholarship involves additional education and pushing to your advisors and to your committee -- this can be very difficult to juggle while simultaneously navigating the demands of your idiosyncratic advisors, research projects, and job market’.

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\(^1\) An online, anonymous survey is conducted at the end of every cohort’s first year, with an approximately 74% response rate (109 responses over four years). Faculty supervisors (50 responses) and external collaborators (80 responses) are also surveyed non-anonymously.
• ‘The expectations of my program are such that an overhaul of the dissertation to the level that I feel is appropriate would simply not be permitted. Any changes are seen as ‘detracting’ from the quality of the thesis, and a reduction of scholarly rigor’.
• ‘It’s frustrating being in the PSI and seeing what’s possible, while feeling that some fields are prevented from fully participating. My field is often held back by narrow ontologies, but we are rarely taught to discuss them, let alone engage and interact with them’.

Improved Research and Impact, Deeper Student Understanding

While formal assessments of PSI-supported research have not been conducted, 95% of the 40 partner organizations, individuals, or communities surveyed agreed that the PSI-students ‘work has contributed or is expected to make a significant positive social contribution’. Students and external dissertation examiners have frequently noted that their new or expanded approaches have resulted in findings that were validated because of their contextualized collaborations and extended peer communities, and in research that generated tangible impacts through context-specific and ‘whole-brained’ inquiry and collaborative action. Perhaps most importantly, students and their supervisors frequently note students’ expanded understanding and appreciation of what their research is ‘about’.

• Student: ‘Finally, after 4 years picking around the edges of the policy side of my topic, I was able to really understand what was going on’.
• Student: ‘It has created opportunities for timely and meaningful knowledge exchange that is directly impacting policy’.
• Partner: ‘The work is contributing to changes in practice as well as in changes in the way services will be delivered in the future - it will benefit youth and families greatly’.
• Partner: ‘The outcome of [the student-led] study of the ways in which people navigate the challenges and opportunities of environmental change…cannot be underestimated’.
• External examiner: the dissertation and embedded artefact (an art installation) ‘enable people to engage directly with the research, providing it a much wider audience than one composed simply of academic readers…It is polyphonic and multi-modal in a carefully crafted manner, like nothing I have encountered before’.
Canadian Consultations

If non-traditional/postnormal scholarship is to be a growing trend for doctoral students, it is important to understand the broader academic community’s perceptions and facility with these forms of scholarship within the members’ own disciplines, and its willingness to value these in the greater sphere of academic work. Accordingly, through a task force of the Canadian Association for Graduate Studies (CAGS), we conducted a two-year consultation with faculty, graduate administrators, and students across the country using a ‘green paper’ to ground and standardize the questions (Canadian Association of Graduate Studies 2016). The resulting Canadian Association of Graduate Studies (2018) report described a ‘nervous excitement’ among the national community. Nervousness stemmed from a number of concerns including the potential for a reduced depth of research, academic career or dissertation examination risks to students, and a perceived ‘dumbing down’ of the PhD. At the same time, people were excited about its potential for increased relevance of doctoral research to the world and to graduates’ careers, its association with an expansion of the ways of knowing and communicating given privileged status in the academy, and its promotion of creativity and broader understanding. CAGS has since created a set of webpages devoted to the topic and has continued the conversation through a number of avenues. A 2019 survey of 24 graduate deans across the country revealed that 95% were supportive of the concepts, and over 80% had one or more programs, policies, or activities devoted to promoting the ideals of broadened dissertation scholarship, or were wishing to implement such initiatives.

Other Current and Future Avenues

We recognize that not all graduate students want to or are able to conduct broadened forms of research in the ways described earlier. Other promising approaches to facilitate transformative learning in postformal ways of thought include coursework that includes collaborative and/or experiential work on complex problems (e.g. Levkoe et al. 2014; Neuhauser and Pohl 2015), especially those providing guidance in systems and design thinking. Pedagogical approaches, generally, that promote reflexivity, perspective transformation, and integrative learning can be effective in helping students develop the twenty-first-century competencies discussed (Baxter Magolda 2007). In alignment with these goals, we at UBC developed an annual competition for faculty to mount a transdisciplinary graduate-level course, ‘Killam Connection’ (University of British Columbia n.d.-b), focused on a complex theme of scholarly and public interest and importance that includes a translational component and guests from both outside and inside academia providing class lectures and public talks. All courses have been highly rated by students, and have led to a number of further interdisciplinary activities, including the planning of a ‘collaborative
PhD’ cohort (described below) by faculty responsible for the first course, ‘Leading the Way Toward a Low-Carbon Future’ (University of British Columbia n.d.-c).

Still in the early stages of planning, the ‘collaborative PhD’ at UBC is being investigated as a means of providing doctoral students the opportunity to conduct collaborative, transdisciplinary—postnormal—research on significant problems, leading to collaborative dissertation components and artefacts. The range of disciplines and partners involved on projects is anticipated to be very broad (e.g. from humanities and engineering to social and natural sciences; partners may include NGOs, communities, industry). It is clear that curriculum focused on how to think and work in postformal ways will be necessary, perhaps as much for faculty as for students.

While no policy changes were necessary to implement the PSI or other initiatives (although additional wording in dissertation guidelines and in external examiner letters was incorporated), we have relaxed the interpretation of the criteria for, and in fact promoted the inclusion of, non-academic members on supervisory committees. We are also investigating the inclusion of non-academic ‘assessors’ of dissertations to provide feedback on those portions or perspectives of dissertations the required expertise for which may not be common among academic examiners.

Many faculty participants in the early days of the conversations leading to these pilot projects felt that it would be more prudent to wait for broader changes in faculty perceptions and academic culture, rather than lead through students’ ambitions for change. While we believe that the successes of the initiatives speak to the validity of this approach, it is clear that general acceptance and wholehearted support does not yet exist in the academy, which continues to hinder wider awareness and uptake of the ideas. As recommended in the CAGS report, key focuses going forward need to include broadened definitions of scholarly excellence in faculty hiring and reward decisions, in research grant funding criteria, and at all educational and administrative levels of the university. As Yehuda Elkana expressed fourteen years ago, ‘It is not enough to rethink the doctorate. We have to rethink the faculty’ (Elkana 2006).

Conclusion

Postnormal times demand an unlearning of many of our cherished scholarly norms, a revisitation of our long-held assumptions, and an expansion of our ways of thinking and knowing. May we continue to reimagine doctoral education in alignment with these commitments, enabling the next generation of doctorate holders to address the planet’s and our society’s most urgent needs with greater courage, imagination, humility, and wisdom.
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