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## **Epistemic fluency and professional education: Innovation, knowledgeable action and actionable knowledge**

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### **Abstracts and keywords**

#### **Chapter 1: [Introduction](#)**

People who can act knowledgably, who are flexible and adept in their use of different kinds of knowledge, and who can shape their environment to generate new insights, are demonstrating a capacity which we call 'epistemic fluency'. This chapter argues that epistemic fluency plays an important, though underappreciated, role in professional life. To understand how knowledge works in routine and innovative professional activities, one needs to look beneath the surface appearance of behaviours and language and find generative patterns – such as epistemic forms and games. This chapter provides an overview of the core conceptual concerns of the book, tracing their development across the 19 chapters that follow. It also provides a summary of the body of empirical research on which we draw when illustrating our arguments.

Keywords: professional work; epistemic fluency; actionable knowledge; knowledgeable action; innovation

#### **Chapter 2: [Professional work in contemporary contexts](#)**

A primary function for this chapter is to build a number of bridges between contemporary writing about the nature of professional work and professional education, on the one hand, and the theoretical exploration that we are providing in the body of the book. It summarises ideas that will be familiar to those who research the professions and to those who are deeply engaged in programs of professional education. It builds on these ideas by offering a preliminary description of the changing nature of professional work – emphasising the roles played by knowledge, and the importance of being able to work flexibly and creatively with knowledge. The chapter also uses a brief summary of a number of common approaches to professional education to start an analysis of the relations between codified and other forms of knowledge in professional work and learning.

Keywords: professions; professional education; workplace demands; codified knowledge; actionable knowledge

### **Chapter 3: Four epistemic projects**

In this chapter, we show how preparation for professional work entails four distinguishable kinds of epistemic challenges – each addressed in terms of a characteristic epistemic project. We organise the analysis using two fundamental distinctions. The first of these is a distinction between representational and performative views on professional action and professional learning. Representational views foreground articulated knowledge and its (sometimes problematic) connections to professional action. Performative views foreground the tight relations between knowing, being and acting in the world. The second distinction concerns working across professional boundaries – the ‘spatial’ boundaries that mark off one profession from another, or professionals from their clients – and the ‘temporal’ boundaries where established and innovative practices mingle. We also make a crucial distinction in this chapter between knowledge work and epistemic work; between using existing knowledge to get work done, and working in ways that create new knowledge.

Keywords: epistemic work; representational view; performative view; relational view; knowledge-building view; connecting knowledge and action

### **Chapter 4: The shapes taken by personal professional knowledge**

Chapters 4 and 5 provide complementary accounts of knowledge. Chapter 4 is a primer on knowledge. It focuses on the individual professional person – on personal professional knowledge. We show why it is useful to distinguish between different kinds of knowledge – public, organisational and personal, codified and non-codified, tacit and explicit – and we develop our argument about relations between knowledgeable action and actionable knowledge: the kinds of knowledge that help get things done in practical situations.

Keywords: personal knowledge; explicit knowledge; tacit knowledge; actionable knowledge; knowledgeable action

### **Chapter 5: Professional knowledge and knowing in shared epistemic spaces: the person-plus perspective**

Chapter 5 extends the arguments developed in Chapter 4 by concentrating on the kinds of knowledge that are needed when people work together. The frame of reference shifts from what an individual might be said to know, to how knowledge functions when professional work is a collective accomplishment. We explore some of the ways that knowledge and knowledgeable action are distributed across systems or networks of people and objects – to constitute shared epistemic spaces. While our focus is on shared professional knowledge practices, we argue that in order to understand professional learning for knowledgeable action and innovation, traditional views of practice – as shared cultural, social and material phenomena – need to be extended at least one level downwards: to include human skills and the mind.

Keywords: inter-professional work; knowledge objects; knowledge cultures; epistemic cultures; shared epistemic spaces

## **Chapter 6: [Understanding the mind](#)**

In this chapter we contend that research in and for education has suffered from a tendency to emphasise one aspect of human capability at the expense of others. For example, some research traditions give a central place to human cognition and marginalise the social; other bodies of research focus on the brain, while marginalising human experience. Chapter 6 uses some recent ideas on grounded cognition to show how it is possible, and necessary, to connect mind, brain, body, culture and environment in providing satisfactory explanations of how people get things done. This also gives us a better way of talking about relations between the kinds of codified knowledge encountered in formal instruction, and the experiential knowledge people develop in the rest of life. We argue that a better understanding of relations between codified and experiential knowledge helps resolve some problems involved in conceptual change and in understanding the status of threshold concepts.

Keywords: Mind; grounded cognition; actionable knowledge; conceptual change; threshold concepts

## **Chapter 7: [Epistemic thinking](#)**

This chapter builds upon an important distinction made in Chapter 3: between using knowledge and improving knowledge. We look at how epistemic resources extend human conceptual system – that is, how the human mind gains an ability to create new knowledge, or, in other words, what kind of conceptual system could underpin human epistemic agency. We use a body of existing literature on personal epistemologies, including research on what people believe about the nature of knowledge, how new knowledge is created, and how one distinguishes between reliable and unreliable knowledge. But our interest in this research is somewhat different from that evinced by its protagonists. We are not that interested in developmental changes and variations in what people believe about knowledge. Rather, we want to know what is involved when people develop a capacity to *use* epistemic resources. We also draw once more on grounded cognition, to position epistemic agency in relation to the environment in which epistemic activity is unfolding. This means we use the idea of epistemic affordances – what the environment offers by way of epistemic possibilities – to refine an account of the skills needed to take up what is on offer.

Keywords: epistemic beliefs; epistemic agency; epistemic affordances; grounded cognition

## **Chapter 8: [Objects, things and artefacts in professional learning and doing](#)**

This is the first major chapter in the book in which we combine outcomes from our empirical research with further development of the main lines of the theoretical argument. In this chapter, we use some of the assessment tasks set for students who are going on work placement (internship or practicum). We argue that when students are tackling an assessment task, they are inevitably engaging in an artefact-oriented activity.

We unpick the nature of this activity – distinguishing between object as motive and object as material entity. We make this distinction, in part, to then look at connections between motive and materiality in the overlapping worlds of the classroom and the workplace. We show that learning for knowledgeable action often takes the shape of an epistemic artefact-oriented activity. This activity connects, rather than separates, abstract knowledge and objects of professional practice with embodied skill through concrete, materially expressed, actions and things. We also distinguish between different kinds of artefacts – showing the ways in which they preserve, transfer and improve upon skills used in the professional workplace.

Keywords: assessment; practicum; objectual practice; epistemic artefact; materiality

### **Chapter 9: [Epistemic tools and artefacts in epistemic practices and systems](#)**

This chapter extends Chapter 8 by following tools and other artefacts into their broader contexts of use. This helps understand how they function in professional work and learning in the larger systems of professional practice. An important feature of this chapter is that we draw upon the different but interwoven epistemic cultures of learning, research and the professions: cultures which come together in the hybrid spaces of the university. We show that epistemic artefacts, produced by students as a part of professional learning, often have multiple functions and, most importantly, that they combine different epistemic qualities. We illustrate these qualities and argue that they provide important bridges between “learning to do” and “learning to understand” – thereby underpinning epistemic fluency.

Keywords: epistemic tools; nature of epistemic artefacts; epistemic cultures; hybrid epistemic spaces

### **Chapter 10: [Inscribing professional knowledge and knowing](#)**

Chapter 10 is the first of a pair of chapters concerned with the role of *inscriptions and inscriptional practices* in professional work and professional education. We use the term ‘inscription’ to cover a wide range of representations that are produced in media (external to the mind). Inscriptions play a vital role in knowledgeable work and innovation, so understanding the nature of professional inscriptions, and how students learn the capacities for inscribing, are critical. In Chapter 10, we analyse the activity of someone who is learning to be a school counsellor, tracing the inscriptional practices involved in completing one of their core tasks. We distinguish between three types of inscription: projective (inscriptions *for* practice), productive (inscriptions *in* practice) and illuminative (inscriptions *of* practice). Building on this ground, we introduce an enactive view of inscriptions and argue that students should be helped to see how - through inscriptional activity - they can both extend their own learning and knowing and improve the systems in which they are working.

These ideas are particularly useful to professional educators who are aiming for a better alignment between educational goals and inscriptional tasks that are set for students. Achieving a better alignment is greatly helped by understanding how inscriptions vary, how they function and what roles they play in knowledgeable action.

Keywords: inscriptional practices; external representations; functional properties of inscriptions; enactive view of inscriptions

### **Chapter 11: [Inscriptions shaping mind, meaning and action](#)**

Chapter 11 continues the theme of inscriptional work, begun in Chapter 10. We shift from a functional to a semiotic perspective. That is, we look at how inscriptions bring forth meanings within knowledgeable action in professional learning and work. Using empirical material from our work with nurse educators and teacher educators, we focus on the kinds of knowledge and ways of knowing that get inscribed. We also argue that traditional semiotic accounts do not provide much assistance in understanding the role of inscriptions in the creation of *new* ideas, particularly those ideas that combine knowledge from multiple disciplines and domains of human activity. We use this to develop connections with the literature on conceptual integration and material blending, to examine more closely how innovation and the generation of new ideas depend upon skilful interweaving of complex cognitive work in the mind with actions in the world. We argue that inscriptions often provide an essential material-symbolic anchor for this complex generative work, which is distributed across body, mind and world.

Keywords: inscriptions; semiotics; conceptual integration; material blending

### **Chapter 12: [Epistemic tools, instruments and infrastructure in professional knowledge work and learning](#)**

In this chapter, our attention shifts from inscriptions and epistemic artefacts to the sets of tools and infrastructures in which such artefacts are produced. In particular, we use ideas about *instrumental genesis* to examine ways in which the qualities of tools and other artefacts combine with schemes for their use. We describe professional epistemic infrastructures as the basic material, symbolic and organizational structures that underpin various knowledge practices. The chapter reviews the status and functioning of *tools* in epistemic work and forges connections with schemes for their use – culturally shared but individually customised epistemic games. A key theme in this chapter concerns the *dynamism* of epistemic work – our analyses of passages of professional activity reveal rapid shifts back and forth between different assemblages of tools and different forms of knowledge and ways of knowing. Different intrinsic and extrinsic properties of the tools that constitute professional epistemic infrastructure have strong implications of how professional work is done and how knowledge and skills for such work can be taught and learnt.

Keywords: tools; instruments; instrumental genesis; epistemic infrastructure; assemblage

### **Chapter 13: [Taxonomies of epistemic tools and infrastructures](#)**

Chapters 13 and 14 are taxonomic. Chapter 13 maps a landscape of epistemic tools and infrastructures, identifying the main kinds of tools and infrastructures and describing

some of their inter-relationships. This taxonomic work does not spring from an academic desire to tidy up a fuzzy space. Rather, we want to argue that professional workers - and those who help them prepare for the professions – can benefit from being able to consciously distinguish between different kinds of epistemic tools, and to think and talk about the tasks for which each is best suited.

Keywords: epistemic tools; epistemic devices; epistemic frames; epistemic instruments; inhabiting epistemic infrastructure

#### **Chapter 14: [Professional epistemic games](#)**

Chapter 14 maps the different varieties of epistemic games to be found in professional work. In general terms, epistemic games are generative patterns of inquiry and we show how this notion can provide insights into ways of working creatively with knowledge in professional fields, not just in the domains of scientific inquiry in which the term ‘epistemic game’ originated. Using distinguishing qualities of epistemic games - such as the sorts of knowledge each produces, and the skills needed to play each game - we identify six main types of professional epistemic games and illustrate how they are played in professional work and learning. But we also note that these games are rarely played just one at a time. They are often woven together into one gradually unfolding situated activity.

Keywords: epistemic games; propositional games; situated problem solving games; discourse games

#### **Chapter 15: [Weaving ways of knowing](#)**

This chapter elaborates on the idea of *weaving* epistemic games, which we introduced in Chapter 14. The capacities needed to play weaving games are often central to professional expertise, yet learning to play them skilfully can cause significant challenges to novice professionals. Through an extended case study, we show how a process of professional inquiry (in Pharmacy) involves weaving together multiple epistemic games. It also depends upon a weaving together of the epistemic games and material and social infrastructures: a skilful linking of conceptual, material and social that must be learned in the process of becoming an effective, innovative practitioner. We conclude the chapter by arguing that professional education often looks to the established disciplines and scientific fields for an ‘epistemic toolbox’ that can underpin knowledgeable professional work. This perspective obscures the fact that professions also have their own ‘epistemic toolboxes’ that they deploy for getting jobs done skilfully and intelligently in practical situations. We argue that professional knowledgeable action requires the capability to take personal ownership of diverse epistemic toolboxes, and learn to combine and deploy these tools within the epistemic practices of one’s profession.

Keywords: weaving games; social infrastructure; epistemic infrastructure; epistemic tools

## **Chapter 16: [Rethinking the material, the social and the embodied for professional education](#)**

In Chapter 16, we revisit some key insights into how the social, the material and the embodied enter professional work and learning. We argue that knowledge work and knowledgeable action are constitutively entangled with embodied practices in the material and social worlds. We show how matter matters in professional work, and how a ‘socially extended mind’ enables thinking with others. This entangling of mind, body and world raises some difficult questions about what it is important to teach in the classroom - and what is reasonable to expect students to learn there - and what needs to be learned in real workplaces. As a part of our argument, we revisit some well-known ideas about the dialectical, dialogical, and triological approaches to knowing and learning. We return to the notion of mediation in professional learning and work. We specifically point to the central, yet often obscured, mediating role of *self-as-knower*, with a resourceful mind and bodily skills, able to act within, and shape, materially and socially rich work environments. Seeing the self as a mediator, coordinator and active constructor of work and learning environments has strong implications for how we should think about professional skilfulness and the professional capacity to learn.

Keywords: mediation; entanglement of mind, body, world; extended mind; coordination; self-as-knower; self-engineering

## **Chapter 17: [Conceptual resourcefulness and actionable concepts: concepts revisited](#)**

Chapters 17 and 18 explore two areas of resourcefulness that are implicated in professional work. In Chapter 17 we focus on conceptual resourcefulness. We start with an important but neglected distinction between concepts in the mind and concepts in discourse. The two are often conflated. Distinguishing between abstract, contextual and situated concepts allows us to clarify the nature of connections between conceptual knowledge and situated action, and to argue that *actionable concepts* play an important role in professional work. We call the ability to make use of appropriate concepts in the flux and flow of demanding professional work *conceptual resourcefulness*. We show how this functions, through an example drawn from our studies of pre-service teachers planning a lesson.

Keywords: actionable concepts; conceptual resourcefulness; abstract concepts; situated concepts

## **Chapter 18: [Epistemic resourcefulness for actionable knowing](#)**

Chapter 18 mirrors Chapter 17, while shifting the focus to *epistemic* resourcefulness. We look at how epistemic resources are treated in accounts of the mind and accounts of discourse; both have to be combined in a satisfactory account of epistemic thought and action. We use the case study of pre-service teachers’ planning to explain the nature of epistemic resources and to introduce the notion of ‘framing’. Framing is a way of describing how people make sense of a new situation – answering the question ‘what is going on here?’ It helps us to understand what enables people to address the challenges

they encounter in work: whether they can respond in innovative and productive, or unproductive, ways. We show that, in solving professional challenges, framing depends upon epistemic resourcefulness – including an ability to coordinate diverse ways of knowing and acting in the world.

Keywords: epistemic resources; epistemic resourcefulness; framing; linking the epistemic and conceptual

### **Chapter 19: [Teaching and learning for epistemic fluency](#)**

In this chapter, we turn towards the practicalities of professional education. We use an examination of four broad approaches to education to assess what each can offer to those professional educators who are looking to teach for epistemic fluency. These educational approaches come from a range of sources – not just from professional education. All these approaches focus on fine-tuning learners' intelligent sensitivity to the critical features of the external environment. However, each of them aims to help learners make distinct connections between different kinds of knowledge and coordinate distinct ways of knowing and acting within the world. Thus, we argue that each has a part to play in completing the jigsaw of education for epistemic fluency. In shorthand terms, the approaches focus on: a) knowledge integration and cognitive flexibility; b) playing epistemic games; c) designerly work on knowledge building and d) learning to design inquiry.

Keywords: epistemic fluency; knowledge integration; epistemic games; knowledge building; designing inquiry

### **Chapter 20: [Creating epistemic environments](#)**

Chapter 20 outlines a fifth epistemic project, extending and drawing together the set of four epistemic challenges and projects that we presented in Chapter 3. The chapter centres on the idea of 'grounded actionable knowledge' – grounding human knowledge and knowing in the physical environment and in an embodied, conscious and conscientious self. Creating and reconfiguring one's epistemic environment thereby becomes an important accomplishment. We conclude the chapter with some thoughts about educational approaches and designs for learning which can be aligned with this expanded conception of epistemic fluency.

Keywords: epistemic fluency; grounded actionable knowledge; epistemic environment; design for learning; conscious and conscientious self.