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Dimensions of Awareness: Art/Design Researchers & Information Engagement

Abstract

From the basis of ongoing practitioner research into the ways that art and design researchers engage with information, this paper explores the difficulties and possibilities inherent in the learning and teaching of tacit knowledge. To know something tacitly is one of many layers coexisting with other more explicit dimensions of individual awareness. Although powerfully instrumental in directing and informing expert thought and actions, tacit knowing is often unarticulated and unacknowledged, which can be problematic in learning and teaching environments. The exploration of dimensions of awareness is a common thread throughout the paper, linking Michael Polanyi's theories on tacit knowing with the phenomenographic research approach, the outcomes of which can promote transformational learning.

Keywords:

Practitioner research; tacit knowledge; Michael Polanyi; Phenomenography; Art education; Design education; Information engagement

Introduction

This paper discusses ideas that have emerged from my own practitioner research into the information practices of practice-based researchers working within art and design faculties in university environments. My practice is as an information professional working with novice practice-based researchers. The impetus for the research came from ongoing consideration of ways to assist art and design students to develop information skills appropriate for practice-based research. A major task was to help students to achieve an appropriate balance between the “scholarly” aspects of university regulatory requirements and the often less structured requirements informing a creative practice. A persistent issue arising throughout the research thus far involves the tacit nature of many aspects of research practice generally, and the particular tacitness associated with the ways that research is informed. This tacitness

not only restricts cognitive access to what actually informs individual creative work, but also places obvious limitations on the ability to pass this knowledge on to others.

Michael Polanyi (1962) argues that tacit knowing is always prior to explicit. Tacit knowing operates at a subsidiary level within the mind, and subtly guides and influences research preferences and modes of practice. This subsidiary guidance is especially true for information engagement activities within research. Every researcher, immersed in their particular information world, recognises and synthesises salient features of that world to create new knowledge. Erich Harth (1995, 9) describes the human mind as “the joiner ... fitting together disparate elements of the world to make objects, systems, scenarios.” This is a deliberate process that largely occurs at the tacit level, particularly in art and design practitioner research, where much of the knowledge acquisition is focussed around the processes of making. Practice-based researchers will often describe their making practice as intuitive. Intuition, in this sense, comes primarily from tacit knowing, a subsidiary process working beneath explicit thinking that informs decisions about what is “right” and what misses the mark. Moustakas (1990, 23) describes intuition as “the bridge between the explicit and the tacit, the realm of the in-between.” Intuitive processes, which occur within all research practice, are relatively unproblematic for individual inquiry, but can cause problems in instructional settings, particularly within highly regulated structures, such as universities. The case of teaching information engagement skills—that is, how to recognise an information need, where to look for that information, how to be open to connections that emerge—is even more problematic. The tacitness of information processes can mask the need for these to be systematically addressed in the learning. This may lead to information engagement skills either not being mentioned, or being discussed in a non-explanatory manner. For example, the artist/researcher may be able to describe the ways that particular insights have influenced her/his work, but will probably be less able to identify the accumulated minutiae that informed the sense that the particular insight was in itself important and should be expressed in this way. Or to use the words of Polanyi, (1962, 42) the researcher will not be focally aware of how he/she was able to “guess right.” That aspect is often too deeply embedded, by layers of experience and thought, to be easily open to introspection. So how is the novice researcher taught to be alert to

what is important? How can the tacit be made more explicit when assisting with the development of effective information engagement practices?

Curiosity about these dimensions of awareness, although I would not have then described it as such, was the starting point of my research. Using a phenomenographic approach, I chose to begin by looking at the practitioner art and design researchers already in the field and to focus particularly on the ways that they approached their work. The phenomenographic research approach focuses on variations in the ways that a particular phenomenon is experienced. By explicating variations in the information practices of expert researchers, I hoped to gain insights into the best ways of assisting beginning researchers. This paper outlines some of the insights gained thus far, beginning with the problem of transferring “sticky knowledge” followed by an exploration of Polanyi’s theories of tacit knowing. The potential for using a phenomenographic research approach to access expert tacit knowing is then discussed and finally, possibilities for transferring phenomenographic research outcomes into ongoing pedagogical design are presented.

The problem of sticky knowledge

Often used to describe the pinnacle of excellence, the name Strativari is associated with the making of fine violins. In Richard Sennet’s (2008) book *The Craftsman*,¹ he speculates about whether it was Strativari’s inability to communicate tacit knowing that led to the failure of his business after his death. His sons, and the apprentices and journeymen who not only studied, but also lived and breathed violin making in Strativari’s workshop were ultimately unable to reproduce the master’s brilliance once he was gone. Like all master craftsmen of that period, Strativari gave extensive guidance to the men who worked with him, yet was unable to transfer the essence of his skills and knowledge. Perhaps his skills seemed ineffable, impossible to articulate.

This idea of the “ineffable genius” has fallen out of favour in our more pragmatic times, but remnants of it linger. Despite acknowledging that some people are naturally gifted, today we are more inclined to emphasise expert skill as coming about through a continual development of knowledge via many years of practice in particular contexts.² But whatever way it is looked at, if the intention of a skilled person is to

pass expertise onto others, instructional processes have to be able to balance the tacit and explicit. Sennet (2008, 78) insists that “Masters should be pestered to explain themselves” but he also wonders if Strativari’s artistic brilliance would even have happened, if he had been required to constantly articulate the process. This we will never know, but the story aptly illustrates the “stickiness” of tacit knowing and makes obvious the danger of not seeking ways to explicate it.³

This stickiness can occur for a range reasons, including unwillingness (knowledge is power) and “embedded-ness” (knowledge is tacit). Master practitioner researchers who seek to teach information engagement skills to art/design students, face at least two significant blocks. The first block might be the teacher’s desire to ensure that the student finds his/her own voice, or style, without undue pressure to follow a previously trodden path. The second block may result from the fact that “making” is at the forefront of awareness, with the research (information engagement) processes happening at a more embedded, subsidiary level. It is possible that in visual arts and design, the master practitioner researcher has honed his/her ability to effectively operate within the liminal space between tacit and explicit knowing to a point whereby information engagement is just something that “happens”, but how, or why it happens is not deeply considered, let alone articulated. This has obvious implications for transferral of skills.

Tacit knowing

Michael Polanyi is the philosopher whose name is most connected with tacit knowledge. Polanyi began his academic career as a scientist but dedicated the latter part of his life to the philosophy of science. Reeling from “scientific” atrocities committed in both World Wars, which were “justified” by the need to advance “objective scientific knowledge,” Polanyi perceived a dire necessity to rethink conceptions of knowledge and, in particular, to realign knowledge with the person, or people, who know (Mitchell 2006, xiii; Polanyi 1962, viii). Adams and Mullins (1978, 29) describe Polanyi’s philosophical thought as “a careful elaboration of the premise that persons are intelligent shapers and holders of knowledge.”

It was through this work that Polanyi developed his theories of tacit knowing. Polanyi came to understand explicit knowledge as being just one aspect of the

knowing process, in some ways, a lesser aspect. He believed that explicit knowledge occurs only via an active process whereby we integrate particulars that are already tacitly known. Thus the tacit is always logically prior to the explicit (Gill 1993). To use a commonly known example, consider the “peek-a-boo” game that enables a baby to understand that a face (or a toy) behind a pillow hasn’t gone forever. The baby’s understanding, (enjoyment or otherwise), of this activity, is enabled by tacit knowing gleaned from previous experiences. We know from Piaget’s research that a child develops reasoning ability prior to the development of speech, that is, can know before he/she has the ability to explain.⁴

This acquisition of tacit knowing accumulates and continues through each of our lives. It is essential, not only when we encounter something new or need to look at the familiar in different ways, but also for the tasks involved in daily living. But levels of awareness are different. We call on tacit knowing at will, but not all of us have the same ability to utilise it and we can be more or less aware of the process, or indeed, of what it is that we tacitly know. It was this realisation that led to Polanyi’s (1967, 4) famous quote “we can know more than we can tell.”

This whole / part pattern perception is probably the most well known aspect of Polanyi’s theory and he acknowledges the influence of Gestalt psychology on his thought. Yet this famous aspect is only one of three components, or strands, within Polanyi’s overall theory of tacit knowing. Stefania Jha (2002, 52) has termed the three strands as Gestalt-Perception, Action-Guiding and the Semiotic, and sees each as linked together by a central, integrating feature of “intellectual passions.”

Whereas the first strand (Gestalt-Perception) focuses on the recognition of part (subsidiary) versus whole (focal) and is mostly passive, the second (Action-Guiding) enables inclusion of the active involvement of the knower, an existential-phenomenological aspect, or intentional action. Here the focus is on the ways that the knower actively moves between focal and subsidiary awareness as meaning is sought and gained. By incorporation of this active element, the theory is able to effectively encompass skilful performance and problem solving skills as forms of knowledge. It is also able to encompass the embodiment of knowledge. Polanyi describes this embodiment as “indwelling” that is, the role our own bodies play in the acquisition and use of knowledge. Sander (1988, 230) further describes indwelling as “the

personal participation of the knower in what he knows.” This concept of “indwelling” can be also be likened to Merleau-Ponty’s notion of “bodily knowledge” or Higgs & Hitchen’s (2007) idea of “embodied intelligence.”⁵ This active, intentional, bodily element has the effect of diluting the distinctions between propositional and non-propositional knowledge, better enabling Ryle’s (1949) “knowing that” (something is possible) and “knowing how” (to do it) to be seen as existing on different dimensions of complexity within the wider spectrum of knowing. The third strand (Semiotic) presents an abstract, structural dimension of tacit awareness. In this strand Polanyi clarifies the vectorial, “from-to” structure of tacit knowing (i.e. from subsidiary awareness to focal awareness) (Jha 2002, 51). Polanyi writes “in an act of tacit knowing we attend *from* something for attending *to* something else” (Polanyi, 1962, 10). That is, (from) subsidiary awareness we are able to give meaning (to) that on which we focus. Mitchell (2006, 71) describes this as enabling us to “attend focally to the object of our attention while dwelling subsidiarily in a variety of clues that stand in the background and make attending to the focal target possible.” This “from-to” aspect is augmented by three other components within the overall structure of tacit knowing, as illustrated in Figure 1.

Figure 1. Four aspects of tacit knowing. Adapted from Polanyi 1962, 9-13.

1. From-to aspect – (<i>attending focally to object of attention, whilst attending subsidiarily to other contextual clues</i>) - the functional structure of tacit knowing.	2. Tacit integration – (<i>the integration of subsidiary and focal objects changes the appearance of what we know</i>) – the phenomenal structure of tacit knowing.
3. From tacit integration & changed appearance (<i>new meaning occurs</i>) – the semantic aspect of tacit knowing.	4. The functional & phenomenal & semantic aspects of tacit knowing combine – (<i>creating new understanding, i.e. something that is more than the sum of its parts</i>) – the ontological aspect of tacit knowing.

Tacit knowledge has been popularly described as something that we *unconsciously* know, but Polanyi saw both the focal and subsidiary as being within consciousness, just at different levels of awareness. Individuals continually interpret their world and in that process will move between subsidiary and focal awareness. If we stop to focus on the particulars (subsidiary) we momentarily lose perception of the whole (focal). To give some common examples, we focus on particulars when learning to drive, (e.g. when to change gears, how much pressure on the accelerator, etc.), but those particulars are subsidiary when we learn to drive expertly. As an expert driver we are only subsidiarily aware of the sound of the engine, until an unfamiliar sound moves it back into focus and we worry about the cause of the noise. In recognising a face we are only focally aware of the whole, not the particulars. If we have to help police create an identikit, the particulars can be brought into focus, with sometimes surprising results. Jerry Gill (1993, 2) describes this movement between subsidiary and focal as the “relational interaction consist[ing] of a push and pull, give and take process in which the knowers and the known mutually define themselves and each other continuously.”

It is important to note that in creating new understanding through integration, the tacit particulars are always transformed, emerging as something else. Sudden realisations, or “eureka moments” do not come out of nowhere, but are the result of that continual process whereby the mind moves back and forth between subsidiary and focal awareness. Gill (2000, 132) states “Polanyi was convinced that at the most significant level, the formulation of problems and hypotheses is essentially a tacit process.” Once a eureka moment occurs, the knowing is irreversible, not only because once known it cannot become unknown,⁶ but also because the interactions of subsidiary and focal awareness cannot be exactly reproduced, the knower is unable to explain exactly how the realisation came to be. Jha (2002, 58-59) comments that “It is irreversible, because the act is directed from selected clues toward completion guided by a hunch — it is the crossing of the logical gap to the solution....The irreversible process of inference in insight is a heuristic process — the act of making an addition to knowledge.” However the new knowledge might in turn become subsidiary and form part of the background knowledge required for deeper understanding or when different knowledge is sought (Sanders 1988).

Intellectual passions

As previously mentioned, Jha (2002) describes “intellectual passions” as an integrating feature linking together three strands (Gestalt-Perception, Action-Guiding and Semiotic). Intellectual passion in this sense denotes that knowing has a personal aspect, although it is grounded in the social. Gill, (2000, 48) emphasises this social aspect when he states:

We come to knowledge as a result of our participation in the lives and thoughts of other persons, both past and present. Knowledge is held, discovered, and experienced jointly on the basis of mutual exploration, support, and communication. Persons act in the world, and in so doing they both acquire and exhibit knowledge.

Polanyi’s concept of “intellectual passions” has been criticised by some as being subjectivist and relativist, but others have demonstrated the ways that this interpretation is incorrect (Jha 2002, 66).

In essence, Polanyi’s “intellectual passions” denote personal commitments, particularly those that individuals make when they decide that a particular intellectual or epistemological stance is true for them. Although personal, these commitments are influenced and guided by particular communities of practice. Polanyi’s background as a scientist saw him using the science community as his example. He talked about the influence of the premises of science, the shared appreciation of scientific value and the standards of criticism and peer review within the scientific community (Polanyi 1962). This is a classical academic community of practice, but the same guidance (in different ways) could easily be discerned in subgroups within the scientific community, or other academic communities, or local community groups, or for that matter, street gangs. Our personal commitment to a community of practice comes about through shared values and rules of conduct.

Whilst not disputing that reality exists, Polanyi believed that our awareness of reality, our interpretation of it, our acceptance of it, means that knowledge of reality is inherently personal. So in the case of the Gestalt-Perception strand, when particulars are reorganised to enable the perception of something new, intellectual passions guide

that aesthetic judgement as to whether the new might be something significant, worth pursuing, or is just another blind alley. In the case of Action-Guiding, intellectual passions instil the commitment to pursue possibilities on the strength of incomplete evidence, heuristic striving via “educated guesses.” Polanyi (1962, 142) states: “scientists, that is creative scientists, spend their lives trying to guess right. They are sustained and guided therein by their heuristic passion.”

In the case of the semiotic strand, intellectual passion is transformed into an abstract form, becoming, according to Jha (2002, 65) a “vector (in the logical form, an inference), guiding action to meaning, yet carrying within it its earlier connotations.” It is this emphasis on meaning and the abstraction of the processes that may be of most use for a practitioner who strives to reflect on how her/his comprehension has occurred. Even whilst acknowledging the impossibility of tracing the processes exactly, this abstract model does, I believe, present possibilities for directing self-reflection, for delivering the potential for deeper comprehension.

Polanyi saw the tacit as being at the root of all knowledge, not just that required to undertake physical tasks, however he conceded that some professions are required to utilise tacit knowing more expertly than others. He saw the highest forms of tacit integration as being “manifested in the tacit power of scientific and artistic genius” followed by the “expert diagnostician, ... [then] the performance of skills, whether artistic, athletic, or technical” (Polanyi 1967, 6-7).

The embedded nature of tacit knowing makes it a problematic subject for research, particularly if we follow Polanyi’s maxim of people knowing more than they can tell. But according to Moss (1995, 6), Polanyi did not actually mean that tacit knowledge cannot be assessed via speech, but rather that origins of specific knowledge cannot be analysed in explicit detail. The previously given example of a police witness helping to create a suspect identikit sketch illustrates the ways that our mind can hold considerable details that, whilst not at the forefront of our awareness, can still be accessed under certain conditions. This allows for the possibility of gaining access to tacit knowing by entering into a dialogue about individuals’ experience of a particular phenomenon. A discussion that focuses on variations of “what happens when x occurs” has potential to tap into some aspects of subsidiary knowing that are guiding

action, and can enable some of those connections to move to focal awareness. A research approach that has particular potential to enable this and also has epistemological commonalities with Polanyi's theories of tacit knowing is that of phenomenography.

Phenomenography

A number of the epistemological assumptions inherent in Polanyi's theories also influence phenomenography. For example, the phenomenographic research approach is non-dualist and relational, as was Polanyi's theoretical position. In describing phenomenography Marton and Booth (1997, 13) state, "The world [as experienced] is not constructed by the learner; nor is it imposed upon her; it is constituted as an internal relation between them." This has striking similarities with Polanyi's thoughts on the ways that knowledge is gained through experiential "indwelling." Like the Action-Guiding strand of Polanyi's theory, phenomenographic enquiry is also based on the concept of intentionality. Dall'Alba (2000, 83) discusses this aspect of phenomenography, saying, "experiences such as understanding or perceiving are directed towards something understood or perceived." A third commonality is the focus on awareness. Marton, Runesson & Tsui (2004, 19) could be describing Polanyi's subsidiary and focal knowing when they say about phenomenography:

We might say that the characteristic of human awareness is that a limited number of objects, aspects of objects, or situations come to attract our attention (i.e. become focussed) whereas a very great number of other things are there as background. It is against this background that we experience the things that we are focally aware of, that is, the things that are a focus of our attention. A generalised and ever changing figure-ground structure is thus characteristic for our awareness.

Clearly the ontological premises of both Polanyi's theory and phenomenography are closely aligned.

Polanyi developed his ideas on tacit knowing through his academic work in the UK from the 1950s up until his death in 1976. In the 1970s, the phenomenographic

approach began to be developed by educational researchers Ference Marton and others, at the Goteborg University in Sweden. Initially used to facilitate research into ways of learning, (eg Marton & Svensson 1976; Entwistle & Marton 1984; Johansson, Marton & Svensson, 1985) phenomenographic research continues to be widely used in educational contexts and, increasingly, is also used in disciplines outside education, eg, workplace studies (Sandberg 2000; Osteraker 2002), and health care (Larsson & Gard 2006; Widang, Fridlund & Martensson 2008).

Phenomenography is related to the broader method of phenomenology in that both focus on experience. Despite this common ground, there are fundamental differences between the two approaches. Whereas the goal of phenomenology is to identify the “essence” of experience, (that which remains the same across all examples under study), the research interest of the phenomenographic approach is variation. Essentially, phenomenographic research is interested in the various ways that certain groups of people, in particular contexts, experience some phenomenon within their life world. The approach is based on the premise that everyone’s experience of the world is different and that our experience is only ever partial because each of us discerns different things. As Marton (1992, 254) explains:

We are seldom aware that our understanding of a phenomenon does not match someone else’s understanding. We are not even aware that we see the world in an individual way. We believe tacitly that we see the world as it is; without further reflection, we take for granted that others see it exactly as we do.

In order to be able to identify the ways that different people experience some phenomenon, particular attention is given to variation, or to put it another way, to the variations of experiential relationships that people have with a particular phenomenon. Phenomenography focuses on the experience, rather than on the individual, or the phenomenon, per say. Furthermore, the phenomenographic perspective is a second order one, that is, experience-as-described, rather than seeking to explore psychological processes or “objective” facts (Marton 1986; Ashworth & Lucas 1998).

Results from many phenomenographic studies have consistently shown that there is a finite limit to the number of different ways any group of people will experience a particular phenomenon, within a particular context or time (Marton & Booth 1997). It is the task of the phenomenographic researcher/s to identify and categorise these variations so that a range of different conceptions (or ways of being aware of) a particular phenomenon can begin to emerge. Within this range, variations are structurally related, that is, each is not seen as a particular individualistic stance, nor as a point on a continuum, but simply as a range of different levels of awareness of the same phenomenon. Akerlind (2008, 635) has described this as “a hierarchy of inclusiveness.” It is inclusive because the awareness is essentially of the same phenomenon; it is a hierarchy because some levels of awareness are more complex than others (for example, more aspects of the phenomenon have been discerned). Phenomenographic data collection typically occurs via semi-structured interviews. This allows for dialogue around aspects of the participants’ experience with a phenomenon that they possibly take for granted, thus having considerable potential for unearthing tacit knowing that is informing action. The interviews are recorded and transcribed verbatim before being iteratively analysed by the researcher (or researchers) to identify categories of descriptions (of differences). Once categories are identified, they are arranged hierarchically, according to perceived levels of complexity and inter-relationships. This hierarchy is known phenomenographically as the “outcome space.” The outcome space is a culmination of the data, but obviously, also reflects researcher/s judgements about categories and relationships. “In phenomenographic terms, the outcomes are constituted as a relationship between the data and the researcher” (Akerlind 2005, 71).

Using phenomenographic outcomes to inform learning and teaching

The educational significance of phenomenographic research outcomes is in providing data to enable the widening of conceptual possibilities. Bruce (2006, 16) observes that “bringing about learning is about expanding experience and awareness, enabling people to navigate wider conceptual spaces.” As a consequence of the utilisation of phenomenographic research outcomes in many different learning contexts, the “variation theory of learning” has developed (Marton & Tsui 2004). Marton (2007, 29) describes this theory as being “driven by an interest in pedagogic knowledge, the question of why someone learns what someone else fails to learn.” The variation

theory also focuses on ways to help learners to transfer classroom knowledge into yet unknown situations, as discussed by Bowden & Marton (1998, 15), who state that “Combining differing views implies richer, more powerful ways of understanding a phenomenon or situation and is likely to offer more options for handling varying conditions.” Thus, in designing learning experiences, teachers informed by the variation theory of learning would be aiming to create opportunities for expanding learner awareness (of a particular phenomenon) in new and potentially more powerful ways.

This focus on learning as an expansion of awareness is also apparent in the research on threshold concepts in learning. Threshold concepts research has been described as being complementary to phenomenographic studies (Cartensen & Bernhardt, 2007), and Davies (2006, 76) describes the phenomenographic and threshold concepts approaches as having a common focus on “ways of thinking.” Threshold concepts themselves are significant points of learning, often likened to a portal through which a learner transforms simple, surface level understanding to one that is more complex and holistic. Gaining awareness of a threshold concept often involves coming to an understanding of “troublesome knowledge” (Meyer and Land, 2006). By highlighting varying levels of awareness of a given phenomenon, the phenomenographic “outcome space” can be used to help identify threshold concepts.

The transformational emphasis of the variation theory of learning and of threshold concepts also resonates with the pedagogical aims of the epistemic games movement. Based on the idea that learning should always be fun and that people learn best by “doing”, these games are developed to allow participants to take on the virtual personae of professionals and to make decisions and learn from mistakes made in virtual “real worlds.” More than just edutainment,⁷ these games provide access to powerful learning opportunities in which participants can experientially apply classroom lessons to real situations and see the consequences of actions through the eyes of multiple personae.⁸ The potential contribution of phenomenographic research outcomes to the epistemic games development is in providing data to add layers of complexity to the presentation of varieties of thinking about the same phenomena.

Conclusion

The common thread, weaving through each part of this paper, involves multi-dimensional aspects of awareness, that is, awareness both subsidiary and focal and ranging from surface to deep. Deep, expert awareness that is too narrowly focussed can sometimes block wider, holistic awareness of what is of overall importance. For example, Strativari's amazing awareness of how to create an extraordinary violin did not extend to ways of effectively communicating like skills to his sons. This cautionary tale highlights the importance of reflecting on taken-for-granted assumptions that might be limiting pedagogical outcomes. Key skills should be identified and made explicit, if they are to be effectively mastered and developed by the learner.

Polanyi's theories of tacit knowing provide rich insight into the ways in which subsidiary and focal awareness work to inform, not only explicit actions, but also intuitive "guesses." His ideas were revolutionary for his time, and not then widely accepted, but are now acknowledged as paradigm shifting; it has been argued that Kuhn's (1996) ideas about revolutionary paradigms were in fact influenced by Polanyi's work.⁹ Polanyi's work on tacit knowing provide us with an interpretive framework for thinking about intuitive knowledge and provides compelling explanations for the ways that skill is developed into expertise through an integration of knowing from different layers of awareness. Without purposeful reflection however, this tacitness will be largely taken for granted and likely to be left out of the instructional process.

The phenomenographic research approach, outlined above, provides an opportunity for purposeful reflection. By directing focus onto a particular phenomenon and by asking experts about their experience of that phenomenon, a researcher can provide an environment within which previously taken-for-granted assumptions begin to emerge. As different ways of experiencing and thinking about a phenomenon are uncovered, it is possible to identify a spectrum of understanding (or awareness) which can significantly inform the pedagogical processes of learning and teaching about this phenomenon.

The variation theory of learning, threshold concepts and epistemic games, briefly outlined in the last section, all provide potential for translating phenomenographic

research outcomes into educational practice. Again, the focus is on expanding awareness by using educational interventions to enable learners to understand their world in wider, more powerful, ways.

My own research, mentioned at the beginning of this paper, is ongoing. I have completed the interviews and am now transcribing that data ready for phenomenographic analysis. But as can be gleaned from the learning processes I have described, research is always more than the anticipated processes described in the initial proposal (e.g. gathering and analysing data). Donald Schon (1983, 79) aptly describes the research process when discussing a designer who realises needed changes to his original design:

When this happens, the designer may take account of the unintended changes he has made in the situation by forming new appreciations and understandings and by making new moves. He shapes the situation, in accordance to his initial appreciation of it, the situation “talks back,” and he responds to the situation’s back-talk.

Thus research is a “reflective conversation with the situation” (Schon, 1983), or to describe it another way, it is an intention towards expanding our dimensions of awareness, and to carefully considering the cognitive paths that this expansion presents.

Endnotes

¹ See Chapter 2, ‘The workshop’, in particular pages 76-80.

² For example see: David Galenson, (2005).

³ For an explanatory example of sticky knowledge see: von Hippel, (1994).

⁴ For example see: Piaget (1967).

⁵ Regarding Merleau-Ponty’s ‘bodily knowledge’ see: Burke & van der Veken, (1993) p. 61. Higgs & Titchen (2007) describe and discuss four research intelligences; embodied, artistic, emotional and spiritual intelligences.

⁶ Except perhaps, in cases of neurological disorders, e.g. dementia.

⁷ Edutainment has the limited goal of making learning fun, without necessarily being based on sound (evidence-based) pedagogical design.

⁸ An excellent example of an epistemic game designed for 9-15 year old children is Quest Atlantis. <http://atlantis.crlt.indiana.edu/#44>.

⁹ A complete issue of the e-journal *Tradition and Discovery* (33, 2), <http://www.missouriwestern.edu/orgs/polanyi/TAD%20WEB%20ARCHIVE/index-archive.html>, was devoted to the discussion of Polanyi and Kuhn interconnections.

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