Making sense of pedagogical knowledge media:

An analysis of how modal composition influences epistemological beliefs

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Acknowledgements

ATTESTATION OF AUTHORSHIP

I declare that this submission is my own work and that, to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Signed: _____

Dated: _____

Abstract

This doctoral thesis is about knowledge and knowing. It considers how the medium by which knowledge is stored and shared influences perceptions about the value and validity of knowledge. The analysis is based on the idea that the unique material composition of the knowledge media of the time, rather than being merely a conduit for transmitting ideational content, deeply influences beliefs about knowledge.

A number of theorists (Eisenstein, 2013; McLuhan, 1962, 1969, 1994; Postman, 2005; Ong, 1977a, 2004, 2012) have analysed how the material composition of mass-print has influenced perceptions of knowledge. Walter Ong (2004) conducted an extensive analysis of early forms of textbooks. In this analysis he found that textbooks have profoundly influenced epistemological beliefs since the Enlightenment, but their influence arose not as a result of good pedagogical design, but as an unintended consequence of the unique affordances and constraints of the highly mechanised production cycles associated with mass-printed texts. As a result of the mechanical processes associated with mass-printing beliefs about knowing and knowledge were based on representations of the world laid out on the printed page (Ong, 2012).

Until approximately 35 years ago the Western world used mainly the same primary media for representing, storing and disseminating pedagogical knowledge that had been used for the previous 500 years. In other words the material composition of the media by which knowledge has been transacted has been stable. But it is clear that a period of intense change is occurring as knowledge media are increasingly digitised at all stages of their production, distribution and consumption cycles. As a result of the processes of digitisation knowledge media are more multimodal, increasingly dispersed beyond one certified knowledge medium and increasingly located outside the nexus of the classroom.

Media ecologists, particularly McLuhan (1994) and Ong (1977a, 2004, 2012), have speculated about the epistemological changes that the digitised knowledge environment would bring, but they tended to take a hypothetical approach to considering these changes. This research seeks to bring a more fine-grained methodological approach to these speculations by developing a media-based methodology (or lens) that shows how knowledge seekers' incremental sensory interactions with the modal composition of knowledge media are mediating changes to beliefs about knowledge.

This research compares three specific examples of knowledge media diachronically along the material axes of time, space and the extent to which the authentic voice of the 'others' who are mutually engaged in the knowledge transaction can be heard. The three media are: a 1960s classroom textbook—Vernon, A. (1965). *Human interaction: An introduction to sociology*. New York, NY: The Ronald Press Company; a classroom textbook from 2010—Carl, J. (2010). *Think sociology*. Upper Saddle River, NJ: Prentice Hall; and the Wikibook— *Introduction to Sociology* (http://en.wikibooks.org/wiki/Introduction_to_Sociology).

The research finds that, as knowledge media are becoming increasingly digitised, a number of subtle epistemological changes are emerging: knowing is increasingly becoming a process of emotional connection with others rather than intellectual engagement with complex analytic categories; personal stories are becoming valued as a way of coming to know; and interpersonal connectedness and trust are increasingly perceived as valued sources of authority.

In other words, the digitised knowledge environment is, rather serendipitously, increasingly facilitating more constructivist beliefs about knowledge.

Despite this increased capacity for digitised knowledge media to mediate more constructivist personal epistemological beliefs, this research finds, rather alarmingly, that there are parallels between Ong's (2004) findings and the current epistemological period: new knowledge media are being incorporated into classroom practice with limited attention to the influence that their modal composition is having on beliefs about knowledge and knowing. This inattention has significant implications for learning and teaching at this time of large-scale investment in new knowledge media. The research provides insight into how the characteristics of the 'packaging' of knowledge shapes perceptions of it. It provides a lens to help teachers, educational policy makers and planners avoid sleepwalking into the 21st century with 19th century perceptions (McLuhan, Fiore & Agel, 1967), and to advance academic consideration of these matters.

LIST OF FIGURES

1   Starting points

This research is a close analysis of how the medium by which knowledge is stored and shared subtly influences perceptions of knowledge. This chapter introduces the research questions. It discusses my personal motivation for undertaking this research, identifies the target audiences for the research, contextualises the research theoretically, methodologically and historically, outlines the original contribution that this research makes to knowledge and provides a chapter-by-chapter overview of the overall structure.

1.1   Inspiration for this research
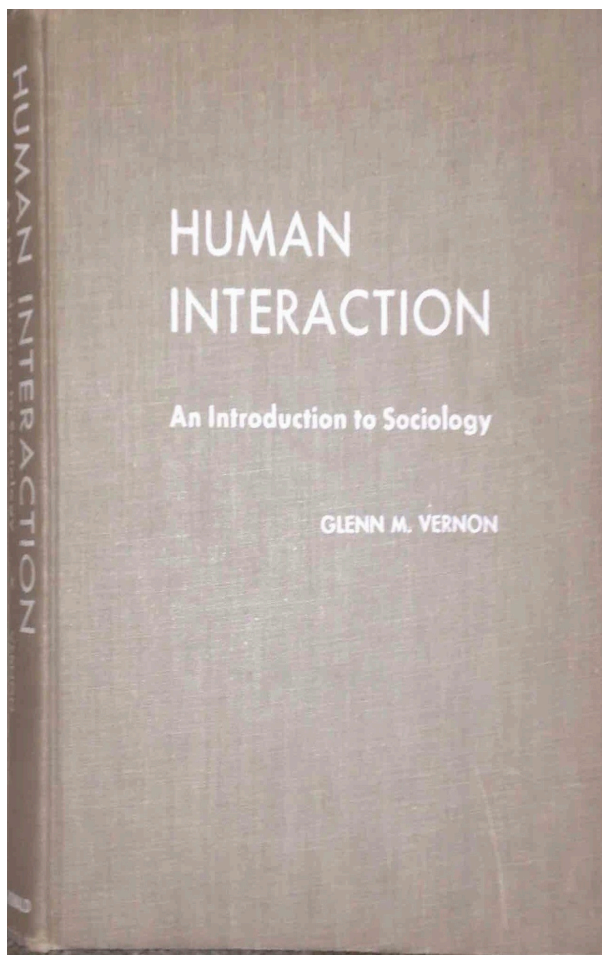
Figure 1. Book cover (Vernon, 1965, np)

The motivation to carry out this research was my discovery in 2012 of an old textbook on a shelf in a storage cupboard when the tertiary institution in which I was teaching was relocating to a new building. As part of this relocation our school manager actively encouraged all staff to throw out any old textbooks that were no longer in active use. While I did discard a number of textbooks, I found myself unable to dispose of this particular text (see Figure 1), published in 1965. I was curious about it. I wondered who had placed it on the shelf and how it had influenced the students and teachers who had used it.

Its material form was unexciting—heavy, dense and drab. Judging by its musty smell, the textbook had been lying unused for many years. However, there were indications that it had, in the past, been well used over a sustained period of time. I noted that its pages were quite worn and, according to inscriptions on the

inside cover, it had been on-sold twice. On the one hand it appeared quaint and strange, a lost object that was now out of the ebb and flow of meaning-making. On the other hand, it was also instantly recognisable as typical of the millions of textbooks of its era that had rolled off the printing presses, and as such was deeply familiar.

Glancing through the text, I recognised the content as standardised introductory subject matter that had been assembled for undergraduate sociology students. As I held the textbook from 1965 and thought about the students who had used it, I had a suspicion that this tool was not as neutral or innocent as it seemed. My curiosity about its unconscious influence was aroused and I wanted to know more about how this textbook had shaped knowledge and knowing. Instead of throwing the text out I put it on a shelf in my new office and thought about how to go about investigating it further.

This thesis describes that investigation. The first half of the thesis applies a media ecology approach to develop a wide-angle perspective on knowledge and knowing. In this context the terms 'knowing' and 'knowledge' can considered as interchangeable because coming to know is always a dynamic process of sensory engagement with the medium by which knowledge is stored and shared. Central to this perspective is the recognition that the media of knowledge are not only those that are generally associated with Western post-Gutenberg perceptions of knowing such as printed books, but also those associated with pre-Gutenberg ways of knowing such as dialogic engagement.

The second half of the thesis takes a narrower (or micro) view of knowledge and knowing. It develops a lens to examine subtle shifts in epistemic perception as the material form of knowledge media changes, particularly under the influence of the processes of digitisation. Most significantly, it shows how the material form of the knowledge medium mediates complex sensory interactions that influence epistemological beliefs. The particular epistemological beliefs that are examined are whether knowledge is stable or unstable, and located in facts or personal constructs, and whether validity is achieved through the authority of a text, as a result of processes of reasoning, or as a result of engagement with others.

It is important to point out that this research is not concerned with analysing the nature of the content of the textbook. There has been extensive research into the content of textbooks including—as is relevant in this case—sociology texts (Crothers, 2008; Graham, 1988; Harley, 2008; Manza, Sauder & Wright, 2010; Morgan, 1987, Platt, 2008). What interested me was not

the content but rather how the form had influenced the perceptions of the students who had used the textbook and, in particular, how it had influenced their beliefs about the nature of knowledge and knowing. In other words, after extensive use of this text and others like it, what did students imagine knowledge and knowing to be like? Thinking about this question led me to the question that underpins this research: how do knowledge media shape perceptions of knowledge? This question has two dimensions. First, what are some of the specific epistemological influences that the medium by which knowledge is stored and shared has on perceptions of knowledge, and how are these changing as the material composition of these media become increasingly digitised? Secondly, what are the sensory processes by which knowledge media influence perceptions of knowledge?

My interest in the epistemological influences of mass-printed textbooks, such as the one I found in the cupboard, was not new. I had been exploring the pedagogical potential of operating outside the perceptual confines of mass-printed textbooks for some time. In 2005 I received a small grant to develop an online tertiary textbook that was designed specifically to both incorporate the emerging affordances of digital technology and actively support the pedagogical practices associated with constructivist theories of knowing. The key pedagogical differentiating feature of this online textbook (http://workstories.aut.ac.nz[1]) was that it used authentic student experiences of communication breakdown in the workplace as its core content. These personal stories were posted online by the students to create a synchronous online venue to share and discuss these communication problems. Threaded through these stories was support and advice from peers and teachers in the form of a series of unfolding, interactive comments.

Designing and implementing this constructivist digitised knowledge medium presented a number of pedagogical dilemmas. For example, if there were no concrete, shared facts to be acquired, how would I know when students had achieved mastery? How would I respond when students explored knowledge outside the boundaries of what was considered to be appropriate for the learning outcomes (such as when students made personal, spontaneous or not overly theoretical comments)? Was it appropriate to allow students to operate outside a body of knowledge that had been tailored for pedagogical purposes, such as conversations with a friend or knowledge obtained through a chat room?

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[1] This link is no longer active but a report on this project can be found in Mules, P. "Using virtual stories to resolve workplace miscommunication." Annual Meeting of the Australian and New Zealand Communication Association. *Conference proceedings* (pp. 72-77). Christchurch, New Zealand. 4-7 July 2005.

[2] On the 12th of March 2015 I emailed Carl at the address included in this knowledge medium. I asked him

In the process of attempting to incorporate the affordances of this digitised knowledge medium into my classroom practice, I realised that there was a fundamental mismatch between my aim to develop a knowledge tool that facilitated constructivist ways of knowing and the epistemological constraints of the established classroom environment. I concluded that it was difficult to develop a learning tool that facilitated mutual influence, that valued relational, dialogic ways of knowing and that incorporated the idea that knowledge is always relative to the cultural and ethnic context, within the constraints of a knowledge environment that was dominated by the knowledge perceptions associated with mass-printed textbooks. The process of designing this digital textbook was intellectually and pedagogically challenging because it highlighted the difficulty of attempting to apply constructivist pedagogical approaches that included authentic experiences and interpersonal interaction, while also operating in a wider environment that was essentially based on didactic pedagogical practices (Mules, 2005).

This misalignment was recently highlighted when a colleague—not a trained teacher— commented that it must be an advantage being a scholar of teaching who understands theories of knowledge. She assumed that having insight into how students come to know about the world must significantly shape and enhance my classroom teaching. Unfortunately, I had to admit that an intellectual understanding that knowing is socially constructed has had minimal impact on my classroom practice. In my daily pedagogical activities I still require my students to reference texts for exams, and questions or dissent are welcome only within the tight constraints of the curriculum. The primary focus of intellectual engagement is between the student and the pedagogical texts; students are discouraged from seeking answers outside the pre-established parameters of assigned texts and little time is allocated for (or value placed on) discussions between students. Invariably when I sit down to plan my lectures and tutorials, or design a new paper, I revert to established patterns of behaviour and, regardless of my best intentions, eventually conform to established classroom practice.

While I can intellectually acknowledge that meaning is made through social engagement with others, that there is no single reality, and that knowledge is individually constructed to find a personal fit, I find it difficult to incorporate these concepts in my teaching practice. The reason for this mismatch, and the theory I am exploring in this thesis, is that I am in the perceptual grip of my everyday knowledge tools and these knowledge tools are crafted, not with a view to supporting the best theories about knowledge and knowing, but as a result of the material

processes associated with the cycles of production, distribution and consumption associated with the era of print.

1.2   Focusing on the material

A number of large-scale studies have demonstrated the epistemological power of tools and how the particular affordances of their production, distribution and consumption cycles have contributed to widespread cultural change. For example, Innis (1951) studied how coins in ancient Egypt extended the reach of human communication and organisational control; Wachtel (1978) examined how the window reoriented social gaze; Eisenstein (2013) examined how the printing press commodified ideas; and more recently Levinson (2005) studied how the shipping container transformed the economies, social conditions and demographics of industrial cities.

The macro-analyses cited above show that the introduction of new tools, and changing sensory engagement with these tools, has the potential to mediate large-scale social change. This research uses a different approach. It uses a fine-grained, micro-analytical approach in order to address the question of *how* repeated, small-scale, incremental, individual acts of sensory engagement with the unique material form of individual knowledge media accumulate to form personal beliefs about knowledge.

The influence of material form on meaning making is at the heart of the relatively new field of media ecology (Levinson, 1997, 1999; McLuhan, 1962, 1994; Ong, 1977a, 2004, 2012; Postman, 2005; Strate, 2004, 2005, 2008, 2012b). From a media ecology perspective examining sensory experience is central to understanding the mediating influence of any medium. From this theoretical perspective the place to look for answers to the research question (how does the medium mediate perceptions about knowledge?) is not the intellectual processes or psychological state of the students who used this textbook, nor is the answer to be found in wider socio-cultural discourses about knowledge. Instead, the answer lies in exploring the sensory experience of the material form of the medium—in this case a textbook.

Although media ecology as a philosophical approach is concerned with the primacy of sensory experience, the theorising of media ecologists (Levinson, 1997, 1999; McLuhan, 1962, 1994; Ong, 1977a, 2004, 2012; Postman, 2005; Strate, 2004, 2005, 2008, 2012b) tends to be at a macro level. In order to bring the rather 'high-level' theorising of media ecologists 'down to

earth' this research incorporates the well-established methodological approach of multimodal analysis (Kress, 2003; Kress & Van Leeuwen, 2001; Norris, 2004; Norris & Jones, 2005; Jewitt, 2007; Scollon & Wong Scollon, 2004). Although multimodal theorists analyse cognitive engagement rather than sensory experience, they do make generalised claims about individual responses to such sensory elements as the feel of the textbooks (for example, whether the paper is dense or flimsy); the extent to which engagement with the textbook is private or public; whether the voice of the author is directly acknowledged in the text; the extent to which the content has been sequenced into a systemised order of headings and sub-headings; whether the content can be remediated into other formats; the modal mix of text, graphics and font style; and how the locating mechanisms such as page numbers and indexing systems dictate the reader's flow of attention.

Analysing the influence of form on the sensory experience (in this case, the sensory experience of knowledge) is challenging because it involves consideration of sensory processes that are subtle and difficult to identify. Textbooks have come to be perceived as the right and natural way of storing and sharing pedagogical knowledge, and therefore their sensory influence has been difficult to discern. Also, the relationship between form and sensory perception is not straightforward because material form arcs or bends sensory perception in subtle, unconscious ways that can lead to unexpected and unintended consequences.

This research aims to provide an analytical framework for making the unconscious changes that are occurring in beliefs about knowledge examinable. It makes no claims to be an empirical analysis. Rather than a 'real world' uncovering of data it develops a way of thinking about the unconscious sensory influence of the knowledge medium. In order to do this it micro-analyses three examples of knowledge media along three sensory dimensions: the extent to which they are temporally sensitive; the extent to which they spatially constrain knowledge by controlling the flow of interaction and binding knowledge to the printed page; and the extent to which they mediate or limit sensory perception of the presence of the other or others who are mutually participating in the knowledge transaction. These dimensions are based on McLuhan's (1994) theorising that every medium is an extension of human sensory experience that exaggerates or limits the particular sensory experience thereby mediating new forms of awareness. From this perspective the "message" of any medium or technology is the change of scale, pace or pattern that it introduces into human affairs (McLuhan, 1994, p.8)

There are numerous examples of knowledge media that could be researched for their mediating effect on the minds of students and teachers over many generations: pens, paper, the classroom teacher, group presentations, group talk, reference encyclopaediae, blackboards and whiteboards, PowerPoint™ and photocopiers, to name just a few, are all mediating tools. Each knowledge tool has its own material composition, and this material composition influences the social interaction and discourse that flows through and around that artefact at all stages of its production, consumption and distribution cycles. These knowledge media together form the mass of educational media of each age, and the repeated interactions associated with them have all contributed to shaping the wider normative epistemological beliefs of the age—for example, whether it is possible, or even appropriate, to measure knowledge, whether knowledge is made up of factual observations about a tangible world, and whether knowledge can be passed in a complete, decontextualised form from one person to another.

1.3   Personal epistemological beliefs— a heuristic

In order to analyse and discuss the subtle sensory perceptions that are mediated by knowledge media, this research applies the research of Brownlee (2001), Hofer (2001), Hofer and Pintrich (1997), Schommer (1990, 1993a, 1993b) and Schommer's (latterly Schommer-Aikin) (2012) into personal epistemological beliefs as a heuristic framework. According to Schommer-Aikin, personal beliefs about knowledge and knowing can be examined along three specific dimensions. The first is the extent to which perceived truths remain true forever or are subject to change. The second dimension is the extent to which it is perceived as possible to know anything with complete certainty and whether knowledge consists of highly certain facts as opposed to constantly changing personal constructs, and the third is the sources of knowledge: the extent to which knowledge is achieved through mastery of decontextualised facts located in the external world as opposed to achieved through the processes of reasoning.

Personal epistemological beliefs, as theorised by Hofer (2001), Hofer and Pintrich (1997), Perry (1999) and Schommer-Aikin (1990, 1993a, 1993b, 2012), provide a way of thinking about how individuals ascribe greater value and validity to some ways of knowing over others. In this research epistemological beliefs are a useful heuristic for theorising the noetic influence of knowledge media, however it is important to recognise that there are other possible ways of perceiving and theorising knowledge, such as the extent to which coming to know is perceived as the development of wisdom, or the extent to which intuition is considered to be a factor to in coming to know.

There are several important caveats to the use of epistemological beliefs as a heuristic for theorising perceptions of knowledge. One of the limitations is that the three particular personal epistemological beliefs chosen for this analysis are a subset of the possible range of personal epistemological beliefs about knowledge. Schommer (1994) researched two other epistemological beliefs: the belief that learning occurs quickly or not at all, and the belief about the extent to which the ability to learn is innate rather than acquired. However, these learning-related beliefs are not the focus of this research, which is concerned with beliefs about knowing and knowledge rather than about the processes of acquiring knowledge. Furthermore, Hofer (2008) raised the point that there may well be epistemological beliefs that might not have been considered or researched yet.

There have been ongoing concerns about the paradigmatic nature of the claims of the epistemological beliefs model (Chan, 2008; Hofer, 2008, Kessels, 2013). One particular area of concern is that the original research methodology was culturally restricted. It was developed in an American context, and the original investigations in the field were carried out on white males in elite institutions in the 1950s and 1960s. While the model has been significantly expanded more recently, it is important to note that ongoing concerns remain about its culturally limited nature (Hofer, 2008). A number of theorists have researched personal epistemological beliefs from a more culturally nuanced perspective. For example, when investigating Hong Kong Chinese tertiary students, Chan (2008) found considerable variation in students' conceptions of knowledge. A comparative study of students in China and the USA (Qian & Pan, 2002) also found considerable variation between students' epistemological beliefs. Zeidler et al. (2013), researching commonalities as well as differences in epistemological beliefs, found variation from subject area to subject area. In the areas of socio-scientific issues and reasoning American and Chinese students displayed a high degree of congruence.

One of the more controversial elements of the epistemological beliefs framework is that it is often applied as a form of value judgment about the extent to which some personal epistemological beliefs can be perceived as more mature or sophisticated than others. Recent research has challenged the universality of the assumption that the trajectory from immature to sophisticated epistemological beliefs extends across all cultural groups (Hofer, 2008; Norenzayan & Heine, 2005). Students with higher academic success in the USA have been shown to have more sophisticated (used in the sense that all beliefs develop on a continuum of

naive to sophisticated) epistemological beliefs than were evident among Chinese students. Lin et al. (2013) investigated Taiwanese and Chinese high school students' scientific epistemological beliefs and found that, in general, Taiwanese students demonstrated more relativist epistemological beliefs than their Chinese counterparts.

Despite the above qualifications, the three specific examples of personal epistemological beliefs provide a helpful heuristic for this research for two reasons. First, they provide a perceptual tool for separating, theorising and analysing individual beliefs about knowledge and how knowledge is imagined to be. Secondly, the perspective of epistemological beliefs allows some way, albeit somewhat culturally overgeneralised, of considering personal perceptions of knowledge from a developmental perspective.

From a developmental perspective personal beliefs about knowledge, knowledge can be seen on a continuum. At one end of the continuum are rigid or immature beliefs—that it is possible to know some things for certain, that knowledge exists in external facts, that the answer can be found within the text and that breaking the world down into its component parts is a valid way of coming to know. At the other end of the continuum is sophisticated knowledge. From Schommer's (1990, 1993a, 1993b) and Schommer-Aikin's (2012) perspective, a knowledge seeker who holds naïve epistemologies along all three dimensions generally believes that knowledge resides in texts, is unchanging and is simple, clear, and specific.

Analysing the subtle sensory influence that the medium of knowledge has on personal epistemological beliefs is not merely an academic exercise. Although personal epistemological beliefs are applied as a heuristic in this research the subtle sensory perceptions that are mediated by knowledge media are highly personally, pedagogically and socially significant. They are highly personally significant because they operate at a level that is below consciousness, and although they are rarely consciously considered they form the basis upon which a person makes decisions, and ultimately the basis upon which a person acts (Hofer & Pintrich, 2002; Kuhn, Cheney & Weinstock, 2000; Schommer-Aikin, 2012). Therefore, if not consciously considered, they have the potential to frame individual perceptions of the world in unconscious and possibly limiting ways.

Epistemological beliefs are highly pedagogically influential for both teachers and students. One of the main reasons for this is that teachers' epistemological beliefs have a significant impact on their pedagogical approach (Brownlee, Purdie & Boulton-Lewis, 2001; Burr & Hofer, 2002;

Hofer, 2001; Hofer & Pintrich, 1997). Teachers who have sophisticated epistemologies believe that knowledge is complex and uncertain, is constructed by the learner, can be learned gradually through the processes of reasoning, and they value student conceptions of knowledge. Accordingly teachers who hold more sophisticated epistemological beliefs use more constructivist teaching styles that engage students in solving real-life problems, emphasise the value of collaborative approaches to teaching, and adopt an investigative approach to research questions and critical thinking (Howard, McGee, Schwartz & Purcell, 2000).

While epistemological beliefs significantly influence pedagogy the primary focus of this research is epistemology rather than pedagogy. From a social and cultural perspective personal epistemologies are highly significant because developing sophisticated ways of knowing about the world can lead to more tolerant, inclusive and humanistic ways of knowing (Schommer-Aikin, 2012).

1.4   The rationale

Textbooks were chosen for analysis in this study not only because they have been the subject of personal interest, but also because they have been highly influential in mediating perceptions about knowledge over a prolonged period (Callison, 2003). Yet, in the course of this research, it has become clear that the mediating power of these assemblies of carefully structured, standardised, static ideas is difficult to perceive and rarely acknowledged. As the literature (or lack of literature) in Section 3.3 indicates, classroom textbooks have so effectively infiltrated everyday assumptions about the right and proper way to represent what is known about the world that their mediating influence has become almost invisible.

Textbooks have restructured consciousness in subtle ways (Kuhn, 1962; Levinson, 1997; Ong, 1986, 2004, 2012) by squeezing thoughts and talk into grids, or perceptual overlays, of written words, sentences, paragraphs, columns, pages and chapters. These overlays have created highly influential perceptual illusions: for example, that knowledge is a physical entity that can be quantified and visualised; that knowledge acquisition is primarily a process of private noetic engagement with texts; and that the presence of the authentic voice of those engaged in the knowledge transaction diminishes the value of the knowledge—all of which subtly influences what is meant by knowledge and knowing in the era of print.

Textbooks are not a glamorous or fashionable genre of media to have chosen for analysis. They sit outside the popular culture of comics, cartoons, television, film or music. Their content is specifically cut down for pedagogical consumption, sanitised to appeal to the widest possible market, and de-contextualised to apply across a range of settings (Callison, 2003). They are a knowledge medium that is specifically designed to store and disseminate standardised, pre-packaged knowledge agreements about the world for specific pedagogical purposes in a format that is easily accessible for learners. Levinson (1997) describes textbooks as "invisible sidekicks" (p. 84). Sørensen (2009) says they are specifically removed from the spontaneity of daily life and are designed just to "talk about something that exists somewhere else" (p. 104).

Amongst the research community the intellectual value of textbooks is regarded as minimal. For example, the research criteria through which funding is allocated to tertiary institutions in New Zealand, Australia and the United Kingdom does not recognise the authoring of textbooks as eligible for points. While there has been ongoing debate about the extent to which textbooks can be considered to meet the definition of original research, the New Zealand Tertiary Education Commission (for example) explicitly states that it is not expected that textbooks aimed at the undergraduate level will be submitted as an output for performance-based research funding (TEC, 2012). At postgraduate level there are some exceptions to this position where textbooks are perceived as developing, validating or questioning theory (TEC). However, overall the commission's stance is a clear indication that textbooks are not regarded as new knowledge but rather as a repackaging of old knowledge for pedagogical purposes. Indeed, the institutional rewards for writing textbooks are considered to be so low that Barber, Donnelly and Rivzi (2013) argue that it is irresponsible for any university to encourage faculty members to spend time on this endeavour.

The motivation for writing textbooks varies significantly from country to country. In a New Zealand context, at a tertiary level, academics write their own textbooks if they are unable to find adequate readings to cover the content they teach (especially if they want to use content that deals with local examples and applications). While some academics continue to perceive that authorship of a widely-used textbook will enhance their reputation with their peers and with employers, most academics see authorship of peer-reviewed research-based papers and books as a more efficient way of meeting expectations to publish. In the New Zealand market

few higher education textbook authors anticipate that authoring a textbook will be financially profitable (M. Loveridge, personal communication, March 7, 2015).

The original contribution that this research makes to knowledge, is to develop a theoretical lens to make the influence of the medium of knowledge on epistemological beliefs more visible so that it can be examined, and ultimately to provide a perceptual lens that allows the material knowledge environment to be consciously selected with a view to mediating more sophisticated forms of knowing. This research has relevance for scholars who are interested in the intersection of media studies and epistemology, particularly those interested in theorising about the influence of digitisation on knowledge media and epistemological beliefs.

This research also has practical application for teachers, school managers and educational policy makers, particularly those who work in formal practice settings and who are looking for much more clarity than currently exists about how to help students develop sophisticated ways of knowing. Given the significant investment in digitised knowledge media in Western countries, it is important for educational decision-makers to be aware of how these media influence epistemology, and for those empowered to purchase knowledge media to choose them not because of 'gee whiz' superficial appeal, but because they mediate more mature ways of knowing about the world.

Another group who would benefit from this research is students. Postman (1979) claimed that formal education had a responsibility to rectify or balance society's media biases by formally incorporating discussion about the changes each new medium brings into the teaching syllabus, and to consider the advantages and disadvantages that result whenever one medium becomes emphasised over another medium. Postman (1995) makes the point that in most schools, students are taught how to use new technologies, but they were seldom taught to consider the use of technologies from an ecological perspective. As will be shown in the literature in Section 3.2 teachers do not seem to consider it important to discuss the limitations or advantages of one medium over another with students. Of particular note is that the influence of the medium of mass print on beliefs about epistemology is not researched or recognised by educational researchers.

Although textbooks have been selected as the primary focus for analysis, the broader aim of this research extends more widely. This is a critical time in human history as the form of the media used for storing and sharing knowledge is changing dramatically as the "typographic

trance" (McLuhan, 1994, p.15) dissipates. New knowledge media will inevitably mediate new knowledge beliefs. This research is ultimately about paying closer attention to the mediating influence of all forms of media that are associated with the formal transaction of knowledge. As the material constraints of mass-printing based knowledge media loosen, opportunities are emerging for teachers, students, parents, educational managers and policy makers to choose and use knowledge media that incorporate more holistic and more relational ways of knowing about the world. This research develops a methodological lens for encouraging all those who select and use pedagogical media to be mindful of the power of these media, to step outside the epistemological influence of mass-printed knowledge media in order to glimpse alternative epistemological possibilities, and to choose and use pedagogical knowledge media that mediate more mature, sophisticated ways of knowing.

1.5 Placing this research in an historical context

Studying pedagogical knowledge media (particularly mass-printed knowledge media) to gauge their phenomenological influence on beliefs about knowledge is not an area of research commonly undertaken by educationalists. As the literature review in Section 3.3 indicates, textbook researchers are primarily interested in analysing the content of texts and examining how they influence pedagogical practice.

However, consideration of mass-printed textbooks from a media perspective is not a new area of study. One of the key theorists who influenced this research is Walter Ong (1977a, 2004, 2012). In his 1954 doctoral thesis, Walter Ong (2004) studied what was arguably the first media revolution by carrying out an extensive and close analysis of over 1000 textbooks written by, and in the style of, the French Renaissance humanist and philosopher theologian Pierre de la Ramee (Peter Ramus). These early 'Ramist' forms of textbooks emerged in the late 15th century and early 16th century, and spread with extraordinary rapidity throughout parts of England, Germany, and Puritan America.

The rapid uptake of Ramist knowledge media signalled a movement away from the oral world of discourse and rhetoric that had dominated perceptions of knowledge and the educational curriculum. Prior to Ramism, teaching consisted of forms of argumentative dialogic interaction in which students took a stand and defended it orally. In university instruction throughout the Renaissance and the Middle Ages writing was subordinate to the spoken word. Even though, from an Ongian perspective, Greek perceptions of knowledge were more visual than Hebrew,

knowledge dialogue was an essential component of Greek teaching and there was very little commitment to text.

It was not until the advent of Ramism that the commitment to the spoken word as the primary knowledge medium began to decline. In the pre-Ramist era the educational curriculum was separated into arbitrary units of grammar, rhetoric and dialectic—three divisions often referred to as the trivium. These divisions of knowledge did not function as unique sciences and no real attempt was made to organise knowledge into intelligible systems based on them (Ong, 1977a).

One of the reasons for the rapid adoption of Ramist texts was that they conveniently systemised elements of the trivium into a series of sequential spatial displays (Ong, 1977a, 2004, 2012). This form of spatial systemisation was applied to a wide range of subjects such as physics, grammar, theology, rhetoric, logic, mathematics and ethics. The visual systemisation of knowledge was perceived to have significant pedagogical affordances that eventually led to the widespread incorporation of these texts into almost all areas of pedagogical practice because, for the first time, knowledge could be easily, and increasingly inexpensively, stored, shared and reproduced.

Prior to the influence of universal literacy, outside the formal pedagogical environment, knowledge and knowing were inseparable from the sensory experience of daily life. Ong (1977a, 2012) described this close connection with the natural world as a feature of all oral societies. The acquisition of universal literacy was a slow process, but one that had a profound influence on normative perceptions of knowledge. With the aid of writing, knowledge became formalised and abstract. Gradually new ways of thinking about the nature of knowledge such as objective reasoning and the importance of a rational, detached mind emerged. Nevertheless, elements of orality continued to influence knowledge practices both inside and outside pedagogical environments until late into the 20th century.

The important point when considering the significance of Ong's (2004) findings about Ramist texts is that it was the form rather than the content of these texts that deeply influenced, and continues to influence, Western epistemology and pedagogy. In other words, the significance of these texts lies not in their content, which has long since become arcane and obsolete, but in their enduring influence on consciousness (Ong, 2004, 2012). When Walter Ong researched this shift from orality to the beginnings of literacy he observed a paradigm shift in the way that

humans think, and that human thinking was completely restructured as a result of the material nature of writing—particularly mass printing.

From an epistemological perspective, the rapid and ongoing adoption of these Ramist, systemised forms of knowledge media have played a significant role in forming modernist beliefs about knowledge (Ong, 1977a, 2004, 2012). For example, Ong (2004) theorised that the Ramist method of representing knowledge on a two-dimensional page led to the illusion that knowledge has a shape or a form, and this illusion contributed to the perception that it was epistemologically possible to stand outside knowledge and perceive it from the perspective of an emotionally detached observer. Ong also theorised that these Ramist texts systemised the presentation of knowledge into carefully structured lines, sentences, paragraphs, chapters and diagrams, and that this had a profound influence on the development of Western systems of logic because it came to be understood that by immersing oneself within the covers of the text it was possible to come to know reductively. One of the most significant influences that Ong attributed to the widespread adoption of the Ramist form of knowledge was that the intellectual detachment that was possible through close intellectual engagement with highly systemised texts enabled one to perceive the world from a 'scientific', emotionally detached perspective.

It is important to note that Ong (1977a, 2004, 2012) acknowledges that there had been some degree of systemisation of knowledge prior to the advent of the printing press. However, prior to the advent of the new mass production print technology, the task of developing the branching diagrams that are at the heart of Ramist system of knowledge was time-consuming and arduous, and one-off manuscripts had limited normative influence because only a small sector of society such as the priesthood and scholars were repeatedly exposed to them.

Ong's (2004) studies of the historical records show that these early Ramist forms of textbooks were embraced with extraordinary enthusiasm throughout parts of England, Germany and particularly Puritan America where they came to be "…tremendously in vogue" (p. 7). What is particularly surprising about this is that, according to Ong, no one at the time seemed to be aware of the profound epistemological influence that these emerging forms of knowledge representation were having on perceptions of knowledge —particularly, in this case, beliefs about knowledge. Without any apparent reflection or consciousness, these new visual forms rapidly permeated Western norms of what is perceived to be valid and valuable knowledge. This casual adoption of form has had, and continues to have, far-reaching consequences. As

Ong's (2004) detailed analysis of early forms of textbooks revealed, their normative influence cycled outward to shape wider social, historical and cultural agreements.

Ong's research in this field has subsequently been confirmed by a number of other theorists (Eisenstein, 2013; Goody, 1977; Levinson, 1997, 1999; Logan, 2004; Postman, 2005; Strate, 2012b) who have also shown the material properties of the early mass-produced pedagogical texts played a fundamental role in shaping wide-reaching and highly influential forms of educational policy and practice such as the professionalisation and standardisation of teaching.

Ong (2004) expressed concerns about the ongoing social and cultural significance of the systemisation of knowledge that began with the casual adoption of Ramism. He was deeply concerned by the loss and devaluation of profound ways of knowing that were associated with dialogic, interpersonal relational ways of knowing about the world. He wrote:

> Ramism might seem merely quaint, perhaps artistically lethal, but of no great importance. Yet its great spread will hardly allow us to regard it as educationally insignificant. As a matter of fact, it has educational significance of the headiest sort, for it implies no less than that it is the 'arts' or curriculum subjects which hold the world together. Nothing is accessible for 'use', that is, for active intussusception by the human being, until it has first been put through the curriculum. The schoolroom is by implication the doorway to reality, and indeed the only doorway. (p. 47)

It has become so normal for knowledge to be systemised into visual hierarchical curricula that it is difficult to discern how the artificial knowledge formats that were set in place in the original Ramist texts have continued to unconsciously influence perceptions about knowledge and knowing. This research suggests a similar lack of attention today to the significance of adoption of new, increasingly digitised knowledge media.

This research can be seen as an extension of Ong's (1954) doctoral analysis of textbooks, albeit using contemporary research methodologies that are specifically designed to analyse and describe the influence that material composition has on meaning. As will be further discussed in Section 2.3, Walter Ong did not have the benefit of these more recent, media-oriented, theoretical approaches: he carried out his studies using research methods associated with the humanities rather than the media, because he was primarily a scholar of literature who "came across" (Ong, 2002, p. 27) the role that form plays in mediating meaning when he recognised the difference between the Hebrew way of knowing and the Greek way of knowing.

Ong identified the primary difference between these two ways of knowing as the extent of sensory engagement with knowledge (Ong, 1977a, 2012; Soukup, 2012). According to Ong, knowing in the Hebrew culture was primarily mediated by the sense of sound. The word was not thought of as an inert representation, but rather as an event in time that was constantly changing: "…a living something, like sound, something going on" (1977a, p. 13). In the Hebrew way of knowing there was a close relationship between speaking and action, and knowing was much more directly located in the human life-world.

In the Greek (particularly since Plato) and Latin cultures, knowledge was more focused on visual representations of words, and ways of knowing were concerned with visually recording the world. Knowing became associated with seeing in the Greek world, although less exclusively so than in the dualistic, Cartesian ways of knowing, that have become associated with Western knowledge (Ong, 1977a, p.3). Formal logic and the orderly organisation of knowledge were central to knowing—as can be seen in Plato's Treatise on Reasoning, for example (Ong, 2012). The Greeks had a "passion for distinctions" (1977a, p. 33), categories and hierarchies. They tended to think about the world as a series of analytic categories of genus and species.

Ong's (2004) observations that the populations of the late 15th and early 16th century (and subsequent adopters of the noetic conventions of literacy) were apparently unaware of the deep, enduring impact that print would have on consciousness is a warning about the risks and consequences of casual adoption of new technology. This situation has contemporary parallels. The highly visually structured pedagogical texts of Peter Ramus appeared at a time of significant technological and social upheaval; today we are in a time of similar upheaval, but one in which the epistemological power of mass-printed text is dissipating rather than consolidating. As Ong found, the social and cultural consequences of rushing into the adoption of new forms of knowledge media can radically influence social and cultural agreements and consciousness at the deepest level. The most disturbing implication of Ong's (2004) findings was that the highly influential Ramist forms of knowledge presentation were arbitrary, shaped rather haphazardly as a response to the affordances and constraints of the technological processes associated with the printing press, rather than by any awareness of epistemological appropriateness.

This research is located in the philosophical field of epistemology because it is concerned with how individuals construe and justify meaning based on their own personal experience and

understanding about the world. Nevertheless, this research also recognises the fundamental relationship between ontology and epistemology. Some ontological perspectives position reality as constructed in the mind of the individual. Others locate reality in the external world. A media ecology perspective finds that the internal, psychological world and the external material world are deeply intertwined. From a media ecology perspective, reality is always a dynamic process of sensory engagement with the embodied world. Epistemology and ontology are inseparable, and what counts as knowledge and how it is acquired is directly influenced by sensory engagement with the material world.

As an example of this intertwined relationship, prior to the invention of script, spoken and heard words were never visually perceived as marks on a surface. This deeply influenced oral man's interpretation of reality because oral man simply could not have linear views (Ong, 1977a). The technologies of writing and print deeply transformed consciousness. Ong describes psychological engagement with the material form of typography as a movement towards a neutralised, devocalised world that has moved profoundly away from man's own personal social world. This shift favoured "a new kind of personality structure" (p. 9). Man became "a kind of stranger, a spectator and manipulator in the universe rather than a participator" (p. 73). Western culture, in this case, experienced significant change as a result of the individualisation influenced by writing. For example, ideas about the 'timeline' of history or scientific, deductive cognitive processes are a direct noetic response to the material affordances of text as a medium for recording information because text provides the capacity to accumulate and organise information in ways that the human brain could not achieve without technological support.

The central position of this research is that epistemological beliefs arise as a sensory response to the unique materiality of (in this case) particular knowledge media and, as such, operate on a level that is subtle, runs beneath consciousness and is difficult to discern. The primary aim of this research is to make these epistemological beliefs discernible so that they can be examined, and ultimately to provide a perceptual lens that allows the material knowledge environment to be consciously selected with a view to mediating more sophisticated forms of knowing.

The following chapters develop a methodological lens to bring a higher degree of consciousness to the adoption of new knowledge media (which inevitably mediate new epistemological beliefs) than was available to the people of the late 15th and early 16th centuries when the vogue of Ramism swept away the established Aristotelian, dialogic notions of

knowledge. In order to do this this research develops an analytical framework from which to examine the epistemological influences of knowledge media—particularly emerging digitised knowledge media. This analytical framework consists of a comparison and close analysis of some of the specific modal elements of three examples of knowledge media. This framework will help the users and choosers of knowledge media to become more aware of how repeated 'micro' acts of sensory engagement with specific material forms of knowledge media crystallise, and eventually accumulate to 'spin off' (Wertsch, 1998) to form broader 'macro' normative cultural assumptions about why some knowledge is more valuable and valid than other knowledge.

The material properties of the early mass-produced pedagogical texts played a fundamental role in shaping wide-reaching and highly influential forms of educational policy and practice such as the professionalisation and standardisation of teaching. Therefore, while these wider social discourses are not specifically the focus of this research, the broader and longer term goal is to provide a theoretical lens to enable teachers, academic managers and policy makers to choose and use knowledge media that mediate perceptions that contribute positively to wider considerations about knowledge, such as how to choose knowledge media that mediate a more humane and wiser society.

Section 5.2 introduces the comparators that have been selected for analysis and comparison in this research, and explains why these particular comparators were chosen. These comparators are: a 1960s classroom textbook—Vernon, A. (1965). *Human interaction: An introduction to sociology*. New York, NY: The Ronald Press Company; a classroom textbook from 2010— Carl, J. (2010). *Think sociology*. Upper Saddle River, NJ: Prentice Hall; and the Wikibook— *Introduction to Sociology* (http://en.wikibooks.org/wiki/Introduction_to_Sociology). These three comparators will be compared diachronically along the material axes of time, space and the extent to which the authentic voice of the 'others' who are mutually engaged in the knowledge transaction can be heard.

1.6   Establishing a structure

This research is based on a diachronic comparison of three examples of pedagogical knowledge media ranging from 1965 to the present day. It compares these three examples to show how the changing materiality of knowledge media, particularly the material composition that is emerging as a result of the processes of digitisation, is influencing the epistemological truth

claims that these knowledge media make. It is based on the philosophical idea that the medium really does shape the message (McLuhan, 1994). In other words, when there is a mismatch between the content and the form of the medium, it is the latter that has more perceptual weight.

The specific question that this research addresses is: how do knowledge media shape perceptions of knowledge? This question has two dimensions. First, what are some of the specific epistemological influences that the medium by which knowledge is stored and shared has on perceptions of knowledge, and how are these changing as the material composition of these media become increasingly digitised? Secondly, what are the sensory processes by which knowledge media influence perceptions of knowledge?

Three main areas of literature are addressed in this research. These areas of literature are woven throughout the research but particularly into Chapters 2, 3 and 4. The first field of literature (broadly covered in Sections 2.1, 2.2 and 2.3) conceptualises the field of media ecology. The second area of literature (Section 1.3 and Section 2.5) considers knowledge from two perspectives. The first perspective is Hofer's (2001), Hofer and Pintrich (1997), Schommer (1990, 1993a, 1993b, latterly Schommer-Aikin's, 2012) research into personal epistemological beliefs about knowledge. The second perspective is a wider philosophical overview of the socially constructed nature of knowing. The third field of literature (covered in Section 3.3) is a broad overview of the research into textbooks and emerging digitised knowledge media. This section highlights the dearth of literature about textbooks as media that influence perceptions about knowledge.

Chapter 2 provides an overview of the philosophical perspective that underpins the central claim of this research: that the sensory experience of the knowledge environment or medium mediates specific epistemological beliefs, and that close attention to the material form of the medium of knowledge is essential in order to analyse which epistemological beliefs are being mediated. Section 2.1 explains the theoretical approach—media ecology—that underpins this investigation, particularly the idea that coming to know is primarily a sensory experience. Section 2.2 theorises about knowledge and knowing over an extended historical timeframe in order to consider knowledge and knowing from a broader cultural perspective than the type of knowing associated with the era of mass print. Section 2.3 discusses the predictions of both Ong and McLuhan about the nature of epistemology in a digitised age. Section 2.4 develops the theoretical claim that close analysis of the material form of the medium of knowledge can

provide clues about why some ways of knowing are privileged over other ways. This section also examines knowledge metaphors to show the unconsciously material nature of beliefs about knowledge. Section 2.5 makes the point that the most philosophically accepted theories about knowledge and knowing recognise that knowledge is anchored in the social world, but that this scholarly perspective is not reflected in mass-printed knowledge media.

Chapter 3 begins with an explanation about why the term knowledge medium was chosen (as discussed above). Section 3.2 provides an overview of the changing material form of textbooks and Section 3.3 gives an overview of research into textbooks. In particular this chapter highlights the dearth of literature about textbooks as a medium that influences perceptions of knowledge.

Chapter 4 develops a methodological approach for micro-analysing the composition of the three chronologically-ordered examples of knowledge media selected for analysis in this research. Section 4.1 justifies the claim that separating and micro-analysing the individual elements of the material composition of the sensory knowledge medium can reveal valuable information about the normative epistemological beliefs that these knowledge media mediate. Section 4.2 explains the phenomenological basis of the research and establishes the phenomenological significance of the presence of 'the other'—the other person or people who are also implicitly involved with sharing and storing knowledge. Of particular importance in the research methodology is the concept of 'mediation' (Wertsch, 1991, 1998). In Section 4.3 this concept is discussed in relation to knowledge media. Section 4.4 shows how the concept of affordances and constraints (Gibson, 1979) provides a way of examining how material form influences epistemological beliefs about knowledge. Section 4.5 develops a methodology for breaking down the material composition of individual examples of knowledge media (whether paper-based or screen-based) into separate material strands or modes.

Chapter 5 applies the research methodology to three examples of knowledge media. Section 5.1 describes the methodological framework by which the three examples of knowledge media that have been chosen for analysis are differentiated and compared. Section 5.2 describes the corpus of knowledge media that has been selected for analysis and comparison in this research, and explains why the three particular comparators were chosen. In Sections 5.3 – 5.5 the three examples of knowledge media are diachronically compared to the extent that they are temporally sensitive, aetherised and acousticised. Section 5.6 examines the extent to which the analysis supports Schommer's findings that those with sophisticated epistemological beliefs

find authority in rational detachment rather than through trust in the certainty of texts. Section 5.7 theorises about the nature of the epistemological beliefs that are emerging in the increasingly digitised knowledge environment. It considers this through the lens of Ong's theorising about an emerging 'secondary orality' (2012). Section 5.8 summarises the findings in Chapter 5.

Chapter 6 discusses the original contribution that this research has made to knowledge. As discussed in Section 2.3, the theorising of both McLuhan (1962, 1994) and Ong (1977a, 2012) is frequently criticised because it lacks a well-developed methodological underpinning. Chapters 4 and 5 address this perceived deficiency by developing and applying a fine-grained methodological lens for analysing the epistemological influence of knowledge media. This methodological approach or 'lens' is the original contribution that this thesis makes to knowledge. Sections 6.1- 6.4 critique this lens. Section 6.1 discusses the effectiveness of micro-analysing the modal composition of the medium as a way of focusing on the material elements of the three chosen comparators, even when these various elements are materially very different and relatively materially evanescent. The second section (6.2) reflects on the methodological effectiveness of separating the sensory experience of knowing into the three sensory dimensions of time, space and sound (these were based on McLuhan's (1994) idea of sensory extensions). These sensory extensions provide a framework for differentiating and examining the sensory influence of each knowledge medium. The third section (6.3) discusses the methodological effectiveness of diachronically comparing small, subtle sensory engagements with specific examples of media over a 50 year period in order to compare similarities and differences, and to examine emerging epistemological trajectories or 'ruptures'. Section 6.4 discusses the strengths and limitations of the heuristic of epistemological beliefs as a framework for narrowing the epistemological focus, and the validity of this framework as a way of attributing value judgments to these beliefs.

Chapter 7 concludes the research. Section 7.1 reiterates the research question and summarises the findings. Section 7.2 is directed at theorists, particularly media ecologists. It discusses the primary contribution that this research has made to knowledge: a fine-grained methodological lens for analysing the epistemological influence of knowledge media. Section 7.3 is a call to teachers, educational managers and policy makers to be more conscious of how they choose and use knowledge media. Section 7.4 discusses future research directions. It outlines the initial steps in design of a rubric to make the methodological approach developed during the

course of this research more practical and accessible for teachers and those who select knowledge media. Section 7.5 is a call for teachers, educational managers and policy makers to value orality (whether face-to-face or via social media) as a valuable medium for coming to know—a medium that has special epistemological affordances.

Throughout this research I use the personal pronoun 'I' whenever I explicitly situate myself in the research, and whenever I am writing directly about my own experience, motivations or actions. The use of 'I' reinforces the point that this research, like all knowledge, is a personal construction. As such it is never neutral, and therefore assuming a tone of detachment and objectivity where I am referring to my own experiences, motivations and actions would be epistemologically inappropriate.

1.7   Key terms

There are four key terms used in this research. The first is the term 'epistemological beliefs' (Hofer, 2000, 2001; Hofer & Pintrich, 1997; Schommer, 1990, 1993a, 1993b; Schommer-Aikin, 2012). This term is used to describe the core perceptions that each individual holds about knowledge: whether it is possible to ever know something with complete certainty, whether perceived truths can remain true forever, whether knowledge is found inside the self or as a series of isolated facts in the external world, and whether breaking things down to smaller analysable components is a route to mature ways of knowing. The concept of personal epistemological beliefs was discussed in Section 1.3. It is developed in Section 2.5, and then further developed in Section 4.6 where epistemological beliefs are applied as a heuristic for framing the analysis in Chapter 5.

The second key term that is used in this research is 'knowledge medium' (or 'knowledge media'). Rather than using the term 'textbooks' this research uses the term 'knowledge media' or 'knowledge medium' to collectively refer to both the sample of textbooks being analysed and to the wider genre of media that are used in formal pedagogical settings. From this perspective people, in the form of interpersonal communicators, books, film, television and textbooks are all examples of knowledge media (Ong, 1977a). The reasons for selecting the term 'knowledge medium' or 'knowledge media' to collectively describe these media are explained in Section 3.1.

The third key term used in this research is the 'other' or 'others'. This term refers to the phenomenological experience of the presence of 'the other'—the other person or people who are mutually engaged in sharing and storing knowledge. This term is explained and developed in Section 4.2.

The fourth key term used in this research is 'knowledge' or 'knowing'. Throughout this research these terms are used interchangeably. This is consistent with a media ecology perspective that claims a fundamental link between communication and epistemology. From this perspective, any distinction between nounal forms of knowledge and verbal acts of knowing is semantic because there is no clear-cut substantive material distinction between the two. All knowing, including knowing mediated by mass print, is to some extent a process of dialogic interaction mediated by various forms of knowledge media, including people. For Ong, "Radically, all human knowledge is held in a dialogue setting…." (1977a, pp. 74-75), all knowledge is a concrete representation of "arrested dialogue" (1977a, p. 315), and sharing and storing knowledge is always, on some level, an unfolding dialogic event mediated within a situated material context. From this perspective any impression of epistemological stability, as mediated by typographic text, is illusory because even in the nounal form of knowledge mediated by typographic text the social element is still present but perceptually minimised.

The problem of the apparent distinction between knowledge and knowing can be resolved by considering knowledge and knowing from a sensory perspective. Ong (1977a, 2012) argued that in oral societies the processes of storing and sharing knowledge were always mediated by interpersonal communication, and was therefore always an event that took place in the phenomenological field of sound that, by its transient and evanescent nature, always involved movement and change. Where sound is the dominant sensory medium of knowing, coming to know always involved engagement between two or more people who were speaking, singing or performing within physical proximity of each other. In this knowledge environment it was easy to perceive knowledge as a verb because there was always psychologically "something going on" (Ong, 1977a, p. 41) and coming to know was always embedded in acts of 'doing' knowledge.

By contrast the Western, post-Gutenberg view of knowledge as a noun or 'thing' is a consequence of the "preservative powers of print" (Eisenstein, 2013, p. xvii). From this perspective typographic technology mediates a number of perceptual illusions: that knowledge can be separated from its owner and passed from individual to individual in an

epistemologically neutral world, and the idea that knowledge can exist outside the individual (Eisenstein, 2013; Ong, 1977). These illusions, mediated by the visual sense, give the perceptual impression that knowledge is a 'thing' made up of visual images and words that "can somehow be dissected into little spatial parts called letters of the alphabet which are independent of the one directional flow of time and which can be handled and reassembled independently of this flow" (Ong, 1977a, p. 42).

Fundamental to any discussion about the distinction between knowledge and knowing is the difference between the ways knowledge is stored in oral societies as opposed to those that are print-based. Due to the constraints of human memory, oral cultures require strategies for preserving information because knowledge that is mediated by human interaction is difficult to store. In an oral culture one can ask about something but one cannot "look it up" (Ong, 1977a, p. 13). The only way that the group can record and preserve the knowledge that is important to them is by a dynamic system of spoken mnemonics such as aphorisms, chants, proverbs, adages, epic poetry, and clichéd culture heroes.

In the absence of writing and images as a means of storing and preserving knowledge, oral memory technologies need to be highly repetitive (copious and redundant) and to arrange what is to be stored in coordinative rather than subordinative patterns. Ong (1977a, 2012) argued that because oral knowledge cannot be stored in abstract forms it needed to be stored in the form of memorable 'happenings' clustered around stories full of actors or agents with an accumulation of extensive causal detail based on attributed human motivation and decisions.

In a literate society such mnemonic devices are no longer necessary. The advent of written records not only enables independence from mnemonic formulae, but relies on visual engagement with words and images inscribed on a surface as "a coded system of visible marks" (Ong, 1982, p. 84). In literate ways of knowing the emphasis has moved from active oral engagement with the medium of knowledge to visual scrutiny of spatially arranged configurations of text and images (Soukup, 2004).

The important point is that, despite the change in sensory engagement from oral to literate ways of knowing, coming to know is still, on some level, a social process, albeit one where the author and reader are separated by degrees of temporal and physical distance.

2   Coming to know through sensory experience

The aim of this research is to investigate how the medium by which knowledge is stored and shared influences perceptions of knowledge. Section 2.1 explains the intellectual tradition of media ecology that provides the philosophical context for this investigation. Media ecology is a theoretical approach that is concerned with the ontological, epistemological, social, cultural and psychological influence of media and technology. Section 2.2 theorises knowledge and knowing over an extended historical time frame in order to consider it from a broader cultural perspective than the type of knowing associated with the era of mass print. This wider temporal and cultural vantage point is important because it establishes the validity of alternative ways of knowing, such as those associated with a time prior to mass-printed texts. It also opens the possibility of thinking about knowledge on a continuum—a continuum that extends into the future.

Section 2.3 focuses on McLuhan's (1962, 1969, 1994) and Ong's (1977a, 2012) predictions about ways of knowing in the emerging, increasingly digitised knowledge environment. It examines the basis upon which they made these predictions and examines critiques of their predictions. Section 2.4 develops the theoretical claim that close analysis of the material form of the medium of knowledge can provide clues about why some beliefs about knowledge are privileged over other beliefs. Section 2.4.1 considers a range of knowledge metaphors in common use to support the claim that unconscious perceptions of knowledge are grounded in material form and to support the close analytical attention that this research pays to material form.

Section 2.5 makes the point that some ways of knowing about the world are more profound than others and that the most academically respected theories about knowledge and knowing recognise that knowledge is anchored in the social world. It develops the idea that some beliefs about knowledge are more sophisticated than others and that the most sophisticated epistemological beliefs are grounded, even unconsciously, in the messy, unstructured world of dialogic interaction, rather than in texts.

2.1   Media ecology: coming to know through sensory engagement

The theoretical position that frames this research is media ecology. Media ecology is a relatively recent scholarly approach that examines media as sensory environments (Postman,

2005). In 2008 Strate claimed that media ecology was a perspective, or a way of looking at the world. However, more recently, in 2011, he rejected these descriptions because he recognised the implicit limitations of the visual metaphors of 'perspective' and 'looking at the world'. In more recent theorising about the nature of media ecology he positions it as an intellectual tradition (Strate, 2011).

The primary claim of media ecology is that sensory engagement with the material composition of the medium by which knowledge is stored and shared is a stronger factor in enduring perception and influence than the ideational content of the medium (Gronbeck, Farrell & Soukup, 1991). This is the point that McLuhan (1994) was making when he claimed that the "medium is the message" (p. 6). In this statement McLuhan claims that the materiality of the knowledge medium unconsciously influences perceptions of the world to a far greater extent than conscious considerations of the ideational content, and that the process of coming to know about the world is a process of sensory engagement with the media of communication rather than a process of cognitive, analytical understanding. This is also the point that Postman (2005) was making when he said, "the form by which ideas are expressed affects what those ideas will be" (p. 31). From this approach, technology and techniques, modes of information and codes of communication are not merely conduits, they significantly influence all aspects of human affairs (Strate, 2008), including consciousness and culture.

A central theme amongst media ecologists (McLuhan, 1962, 1969, 1994; Ong, 1977a, 2004, 2012; Postman, 1979, 1982, 1992, 2005; Strate, 2008) is that the medium of communication operates as part of a system: in other words, every medium is subtly interconnected with every other medium. From a media ecology perspective the medium by which knowledge is transacted, however it is defined, is an interactive, sensory environment or system where the communication between the knowledge seeker and the knowledge medium is a two-way flow of meaning-making. According to McLuhan (1994), this sensory interaction between the communication environment and the particular medium of communication is deeply influential in determining the thoughts and actions of people and society in a 'soft' way: operating in an implicit and subtle level that is sensory and beneath consciousness. Ong (1977a) describes this interactive medium as a "sensorium" in which "the entire sensory apparatus" is an "operational complex" (p. 6). This concept of the interactive flow of meaning-making is further developed in Section 4.4 where the concept of mediation is developed.

Theorising about and analysing the nature of the medium or media through which knowledge is transacted is at the heart of the thinking and researching of media ecologists (McLuhan, 1962, 1994; Ong, 1977a, 2012; Postman, 1979, 1992, 2005). Postman (1979) describes the medium as the "modes and patterns of communication which control the kind of society it is. One may call them information systems, codes, message networks, or media of communication" (p. 29).

It is noteworthy that McLuhan (1969, 1994) and Postman (2005) have apparently conflicting conceptualisations of media within the intellectual tradition of media ecology (Barnes & Strate, 1996). McLuhan claims that the communication medium serves as an "extension" (p. 26) of the central nervous system, and the particular extensions of the medium control the speed, scale and specific forms of human association and action. He takes a broad-ranging perspective on these extensions and claims that the list of possible extensions is endless—it includes cars and money (for example).

Whereas McLuhan (1969, 1994) refers to media as extensions, Postman (2005) tends to refer to a media environment. According to Barnes and Strate, these two perspectives differ in emphasis rather than essence because "any extension of the body would by definition be something other than the body, and therefore be part of the body's environment" (p. 182). McLuhan himself agreed that there is a great deal of overlap between the terms extension and environment: "to say that any technology or extension of man creates a new environment is a much better way of saying that the medium is the message" (McLuhan & Parker, 1969, p. 31). A problem with the term extensions is that it positions sensory engagement as a process of one-way, linear engagement via a conduit or pipeline (Ong, 2012). In terms of this research, although frequent use is made of McLuhan's extensions as they relate to the three sensory dimensions of time, space and sound, it is important to note that these extensions exist within a sensory environment and therefore these terms are used interchangeably to refer to the subtle, interactive, mutually mediating influence of the sensory environment.

A central concept in media ecology is the idea that the introduction of a new medium changes human perception by changing the "scale or pace or pattern" of human "association, affairs, and action" (McLuhan, 1994, p. 43). These subtle alterations in sensory amplification or acceleration mediate unconscious psychic influences that are the real meaning or message that is mediated by a medium regardless of the ideational content that the medium carries. McLuhan used these sensory extensions as a way of theorising the two-way flow of interconnection between human beings and their sensory experience of the world.

Ong (1977a, 2012) went so far as to attribute the differences between the major communication eras to the changes in sensory engagement associated with the sensory environment of that era. He claimed that this paradigmatic concept applies across all cultures and genders. However, he argued that because humans attend to sensory experience selectively, they must necessarily make perceptual choices, and these choices are culturally determined. From this perspective, each culture has its own sensory balance and different cultures attend to different senses with different intensity at different points in their history. By way of examples, Ong describe how some cultures are more tactile than others, and that 18th century Western culture placed particular perceptual emphasis on taste. The significance of the role of the senses in coming to know is what Ong was referring to when he wrote (1977a), "Growing up, assimilating the wisdom of the past is, in great part, learning how to organise the sensorium productively for intellectual purposes. Man's sensory perceptions are abundant and overwhelming. He cannot attend to them all at once. In great part a given culture teaches him to organise his sensorium by attending to some types of perception more than others" (p. 6).

There is no doubt that Ong's theorising about the sensory transitions of knowledge, particularly from orality to print, has been predominantly focused on Western culture (1977a, 2012). However, one of his primary research motivations was to challenge the highly visualised forms of knowledge that have come to be the perceptual norm in Western, post-Gutenberg, Cartesian ways of knowing. His theorising can be seen as a critique of the hegemony of these ways of knowing. He was very much concerned with encouraging broader, more inclusive forms of holistic understanding that embraced cultural and epistemological pluralism.

The sensory difference between the experience of the spoken word and the experience of mass-printed text is central to the theoretical basis of this research. Both McLuhan (1962, 1969, 1994) and Ong (1977a, 2012) attributed the sense of sound and the associated phenomenological experience of the spoken word with particular epistemological affordances because sound as a medium of knowing has a capacity for total sensory immersion. Oral ways of knowing mediated a more communally harmonious, collective way of being because sound united people more than any other sense (Ong, 1977a).

In their research into historical shifts in consciousness, both McLuhan (1962, 1969, 1994) and Ong (1977a, 2012) make the point that literate Westerners find it difficult to appreciate the extent to which the processes of abstraction associated with visual engagement with text mediated shifts in consciousness—in particular they refer to the noetic shift from interiority to

exteriority. They claimed that the auditory sense mediated an exteriorising of consciousness that had significant noetic effects. For example, those who lived in primary oral societies experienced a greater sense of sensory immersion in their immediate surroundings, and a greater sense of harmony (in the sense of consistency and accord) and unity within their tribal group compared with the individually oriented consciousness and motivations of literary man.

The interiorisation associated with sound as the primary sensory medium had a number of ontological consequences. One feature of cultures where knowledge is mediated by sound is that they have a more relationship based, collective approach to knowing. Ong's (1977a) phenomenological investigation of sound and human understanding found that one of the primary communicative motivations in oral societies was to seek harmony within the group. From a literate perspective this is a profound distinction. For example, in oral cultures there was no history in the modern sense of the term because the past is present in the speech and social institutions of the people rather than in the abstract forms associated with modern history. Rather than being interested in accuracy of recall of the past, the communicative motivation was to achieve harmonious relations within the group, and this was more important than truth.

Another ontological feature associated with primary oral societies was that oral man tended to solve problems in terms of "the tradition of the tribe" (Ong, 1977a, p. 135) without much personal analysis. Literate societies encourage individuals to think a situation through independently, whereas oral cultures imposed considerable public pressure to avoid individual or original thinking in order to ensure social harmony or consensus.

Another element in which oral ways of knowing were oriented towards harmonious relations within the group was that they were aggregative rather than subordinate (Ong, 1977a, 2013). Oral thinkers tend to think associatively—they looked for connections. Literate thinkers tend to think analytically by taking the object out of its environment and breaking it into its various component parts.

According to Ong, primary oral cultures were centred on the human experience, or life-world (1977a, 2012)—because they had no way of recording information for future reference, they assimilated "the alien, objective world to the more immediate, familiar interaction of human beings" (1977a, p. 42). In oral societies social structure were built "to a degree intolerable today on personal loyalties rather than objectification of issues" (p. 62).

Ong (1977a, 2012) and McLuhan (1962) both claimed that the shift from oral ways of knowing led to visual engagement with decontextualised abstractions on the printed page, and this had profound ontological and epistemological consequences. They argued that it was only when people began engaging with intellectual abstractions on the printed page that they began to see themselves as individuals with unique identities. Print culture encouraged humans to think of their own interior consciousness as more and more impersonal and religiously neutral, leading to the interiorisation and abstraction of thought processes and the decontexualisation and abstraction of thinking. Eventually this externalisation mediated the emergence of the "visually based notion of the stable self" (Ong, 2012, p. 129).

Sound as a medium is related to polemics (Ong, 1977a, 2012). One of the characteristics of primary oral cultures is that that coming to know involved much more direct, spontaneous human interaction than in literate cultures. The close physical proximity of the other meant that knowing was more highly emotionally charged than in literate ways of knowing in which the presence of the other is mediated by text. Paradoxically this close proximity and the associated spontaneity of engagement led to a level of emotional intensity and personal tensions in coming to know that Ong described as agonistic. Close communal life created increased community hostilities and people tended to live in cycles of "praise and blame, virtue and vice" (1977a, p. 201). The agonism in primary oral cultures was often ritualised as wars of words, verbal banter such as riddles and challenges, song contests, name-calling, and bragging. In primary oral cultures there were often formalised cycles of dispute and resolution of dispute.

Knowledge that is mediated by print technologies removes the close proximal relationship with the other. Texts negate the need to be physically present with fellow interlocutors. Knowing becomes less spontaneous, and therefore the emotional intensity of oral cultures is more subdued—less agonistic. From an epistemological perspective, the technologies of print mediated the perception that knowing and knowledge are objective and free of emotion.

According to McLuhan (1969, 1975), one of the main sensory affordances of the acoustic medium is that it engages multiple senses at the same time. From a sensory perspective aural/oral engagement between the knower and the known does not require the sensory world to be fragmented in order for it to be understood; rather, multiple sensory experiences can co-exist simultaneously. The sense of sound has the capacity to accentuate the connections between things rather than the distinctions between things. Therefore, as a sensory medium for knowing, sound affords more profound ways of knowing because it offers a more nuanced

understanding of human motivations and a deeper empathic engagement with others. Of particular note is that, according to McLuhan (1969), it is epistemologically preferable if the medium of communication promotes a balance between the senses of sight and sound. He argues that the intense visualisation associated with highly representational forms of knowledge media is epistemologically limiting.

From a sensory perspective, the reason that the printing press had such a profound impact on knowledge and knowing was that it restructured lived experience from a primarily aural experience to a visual experience (Levinson, 1997; McLuhan, 1962, 1969, 1994; Ong, 1977a, 2004, 2012). According to McLuhan (1969), the phonetic alphabet "fell into this world like a bombshell" (p. 6) and changed the knowledge sensorium so that sight became the dominant sense and replaced "in-depth communal interplay with visual linear values and fragmented consciousness" (p. 6). As a consequence of this restructuring of knowledge into representational forms a new sensory balance that was more linear, logical and categorical emerged. Ong observed that this restructuring of human experience on to the two-dimensional page fundamentally reframed the sensory experience of knowing, because in a print-based society coming to know was perceived as an intellectual process of mastering the elaborate analytic categories that form the basis of intellectual engagement in literate, typographic societies.

A constant theme in Ong's theorising is the phenomenological power of 'the word' (Farrell, 2000). It is important to stress that Ong (1977a, 2012) is not interested in words in their written, representational sense, but rather words as a transactional medium for communicating with, or experiencing the presence of others. From Ong's theoretical position, when the spoken word was the primary medium of storing and sharing knowledge, coming to know always involved experiencing the presence of the other person or people mutually engaged in the act of coming to know—the word and the other were always co-present. In other words, the experience of knowing in an oral age was not derived from the communicative meaning of words but from sensing the presence of others who were also mutually engaged in the experience of coming to know through face-to face, dialogical communication.

There is no doubt that both McLuhan (1962, 1969, 1994) and Ong (1977a, 2012) attributed the sense of sound and the associated phenomenological experience of the spoken word with special epistemological status: they believed that the auditory sense enhanced knowing in special ways. Amongst media ecologists there is widespread agreement that something was lost

during the intense processing and spatial arrangement of knowledge that was associated with the printing press. Ong (1977) described this loss as a closing down of the imagination.

Ong, in particular, perceived interpersonal dialogic communication as a sophisticated way of knowing that had unique affordances and communicative properties that should be aspired to (Ong, 1977a, 2012). He claimed that, as a medium for storing and sharing knowledge, interpersonal dialogue opened up different and distinctive forms of sensory experience. In particular, coming to know in a primarily oral knowledge environment involved the phenomenological experience of the presence of the other or others who were also mutually engaged in knowing, and this was highly phenomenologically significant because a different range of variables such as trust, risk, empathy and self-disclosure became included in the sensory knowledge experience.

According to Ong, oral forms of knowing involved "…close, empathetic, communal association" (2012, p. 46) with others and transactional forms of communication which involved interactions such as proposing new ideas, testing the waters and being rhetorically sensitive to the contextual situation. Innis (1951) described the more spontaneous forms of knowing in an oral society as having a "freshness and elasticity" (p. 190) that allowed knowledge participants to see the other person's perspective and grasp alternative points of view. This relational connection with others is at the heart of Ong's (1977a, 2012) interpretation of what it means to know in an oral society.

The unique affordances of orality as a medium of communication are a key element of the writing of Walter Ong, but his valuing of oral ways of knowing was very much a response to the post-Gutenberg hegemony of print. His concern was that the spatial/visual analogues associated with the medium of print, when used un-reflectively, encourage closed system thinking and being that slights becoming, depersonalises knowledge, and trivialises human communication" (Zlatic, 2011, p. 9).

Of particular note for this research is McLuhan's (1994) idea that aural/oral interaction through language (as embedded in interpersonal communication) is a medium with its own unique materiality that influences the unconscious flow of interaction. This is important because, as a number of theorists have predicted (Levinson, 1997; McLuhan, 1994; Ong, 2012; Perkinson, 1984; Pettitt, 2009; Strate, 2012b) and as will be developed in Section 5.4.2 there are indications that the incorporation of the processes of digitisation into knowledge media is

increasingly mediating the epistemological affordances associated with the spoken word, albeit as mediated by text.

From the epistemologically profound perspective of media ecology, the medium through which the world is represented in the era of literacy, and the implicit affordances and constraints of the medium of mass-printed texts, has had greater impact on normative epistemological values than the ideational content that these representations carry.

2.2   The importance of considering knowing over an extended timeframe

Media ecology, as a school of thought, is concerned with the history of consciousness. From a media ecology perspective, shifts in consciousness do not occur as abstract historical occurrences—instead they can always be traced to changes in the sensory experience of the media of communication of the time. From this sensory perspective, cultures range on a continuum based on the sensory experience of the dominant media of knowledge sharing and storage —in other words, consciousness is influenced by the degree that the senses of touch, taste, and, particularly from a Western perspective, orality and literacy are dominant at any given time. Coming to know is a human activity that is carried out in a variety of forms and across all societies, rather than just the visual, analytical, post-Gutenberg or reductive (Rata, 2013; Skinner, 1953) ways of knowing that have become intellectually habitual in the formal Western education system in the era of mass print.

It is a feature of all social groups that they seek to store and share the knowledge that they perceive to be important within the group, and to pass this knowledge on to ensuing generations (Ong, 2012; Postman, 1998, 2005; Strate, 1986, 2010). The primary medium for storing and sharing such socially shared agreements for thousands of years, prior to the use of text, was the spoken word (Furniss, 2004; Goody, 1977; Logan, 2004; McLuhan, 1962; Ong, 1977a, 2012). Ong (2012) described cultures that used the spoken word as their primary medium of storing and sharing knowledge and who had experienced limited exposure to text as "primary oral cultures" (p. 46). Ong (1977a, 2012) identified a number of differences in the nature of coming to know in primary oral cultures where the members of that culture had limited experience of the written word. He observed that, in comparison to literate cultures, knowing in oral cultures was additive rather than subordinative, evanescent and not permanent, close to the human life world, agonistically toned, empathetic and participatory rather than objectively distanced, and homeostatic. The key difference he identified (2012) was that, in a

world where meaning was negotiated orally, the primary motivation for coming to know was to establish interpersonal trust and form relationships with others rather than participate in a process of formal reasoning and reduction.

There have been a number of phases in development of ways of storing and sharing knowledge using text as the primary medium. These phases have ranged from the use of the phonetic alphabet, to handwritten manuscripts, to the printed documents of the Renaissance, to mass-printed knowledge media, to the digitised media of today. There is general agreement among theorists (Eisenstein, 2013; Farrell & Soukup, 2012; Finnegan, 2002; Furniss, 2004; Goody, 1977; Logan, 2004; McLuhan, 1962, 1994; Ong, 1977a, 1986, 2012; Poster, 1995, 2007; Postman, 2005; Strate, 2010; Street, 1995) that each of these material shifts in the form of storing and sharing knowledge had significant psychic and social consequences. While each of these phases of textual communication have had significant noetic influence, this research is particularly concerned with the epistemological influence of mass-printing and how this epistemological influence is changing as a result of the shift to digitised forms of knowledge media.

Despite literacy being a relatively recent stage in human development, literate modes of thought have deeply influenced epistemological beliefs and have, over time, become so deeply engrained that the highly influential medium of print has come to be perceived as the right and appropriate way of knowing about the world, at least for literate Western society.

Ong (2012), Postman (1998) and McLuhan (1994) all agree that the media of knowledge, as they evolve and change do not cancel each other out, but rather build on each other. From this perspective, while media ecologists refer to the oral, print and electronic eras, there are no sharp contrasts between ways of knowing in oral societies, literate societies and digital societies, except from a wide angle, retrospective, historical perspective. In other words, the noetic changes that media ecology, as a school of thought, is concerned with occur gradually as the material form of knowledge media evolves and individuals are exposed to sensory change.

It is also important to note that, while it is theoretically useful to position oral and literate forms of knowing as distinctly different, from a practical point of view such a sharp division is artificial because almost no primary oral societies (cultures that have experienced little or no exposure to literacy (Ong, 2012)) remain today. Also, while Ong, Goody (1977) and McLuhan (1962) all acknowledge that there are distinctions between the thinking of oral and literate

societies, they also acknowledge that all societies are, to some extent, analytical. According to Luria (1976) and Vygotsky (1962), making classifications is fundamental to human survival. However, the important point for this research is that, according to Ong "…an abstractly sequential, classificatory, explanatory examination of phenomena or of stated truths is impossible without writing and reading" (p. 8).

Some theoretical traditions theorise oral and literate cultures and ways of knowing as separate worlds of discourse but the strength of a media ecology perspective is that they are perceived on a continuum (Foley, 1996). The artificial distinction between the ways of knowing in oral and literate societies is sometimes referred to as 'the great divide' (Chandler, 1995). While this term is frequently attributed to Ong's theoretical perspective, it was not a term that Ong himself ever used (Farrell, 2000). Indeed, according to Farrell, not only did Ong never specifically use this term, at no point in his theorising did he imply the existence of a major separation between oral and written cultures—in fact Ong has consistently rejected notions of a binarism between orality and literacy. Although he refers to an "orality-literacy polarity" (1982b, p. 135), he more consistently describes orality-literacy dynamics (1982, p. 179). Ong also specifically refutes a deficit model saying that examining orality from the perspective of literacy is like "trying to work out the biology of a horse based on what goes on in an automobile factory" (1977, p. 19).

There are occasions when media ecologists do theorise distinctions between orality and literacy, however this tends to be as an analytical device to establish contrast and comparison as a way of emphasising differences and distinctions (Strate, 2011). In other words, examining the form of knowledge media that existed prior to literacy provides insight into epistemological alternatives to ways of knowing that were mediated by the technologies of mass print. As Ong (1977) wrote, it is only when we have entered the electronic stage that man has become aware of the "profundity of differences" between the oral culture and the culture initiated with writing and matured with alphabetic type. Ong went on to write that "apparently it is impossible for man to understand the psychological and cultural significance of writing and print and of oral expression itself, with which writing and print contrast, until he has moved beyond print into our present age of telephonic and wireless electronic communication" (p. 18).

Rather than suggesting any diminution of the print era, this research applies McLuhan's (1994) idea that rather than being binary, the affordances of one epistemological shift over another are always a process of gains and losses. As further discussed in Section 4.5, Postman (1998)

refers to this as a Faustian bargain. From this perspective, while print may be seen as limiting more intuitive ways of knowing, "typographical fixity" (Eisenstein, 2013, p. 87) enhances other ways of knowing because it is a basic prerequisite for the rapid advancement of learning.

Any discussion about the affordances and constraints of knowledge media provides a way of opening discussion about alternative and emerging ways of knowing. The medium of writing, as the dominant means of communication is being challenged (Kress, 2003). A number of theorists (Levinson, 1997, 1999; McLuhan, 1994; Ong, 1977a, 2012; Perkinson, 1984; Pettitt, 2009; Strate, 2012b) have suggested that digitisation is bringing about a return to less visual, more oral forms of knowing. This return to pre-Gutenberg ways of knowing is what is implied by the term 'the Gutenberg parenthesis' (Pettitt). Despite the possibility that some of the features of oral ways of knowing may be incorporated into the digital ways, Ong (1977) argued that there is never a complete return to the past because the successive media do not abolish one another but overlie one another. It is too early in the transition to digitisation to do more than speculate about what sensory influences and epistemological beliefs knowledge media mediated by digitisation will bring about.

From an extended, historical perspective, the literate mind-set, particularly that associated with mass-printed media, is just another communicative stage—a stage that has only relatively recently influenced human consciousness. The recognition that literacy, as a way of knowing, is a cultural phase is what McLuhan (1994) meant when he wrote that "every culture and age has its favourite model of perception and knowledge that it is inclined to prescribe for everybody and everything" (p. 5). From this controversial perspective, the various epistemological periods or stages —such as the Enlightenment; modernism, with its concern with form, essences and abstractions (Turkle, 1995); and postmodernism with its challenges to meta-narratives (Lyotard, 1989)—are all responses to the dominant epistemological medium of the age. Until approximately 35 years ago, the dominant medium for storing and sharing knowledge was mass-print.

There is widespread agreement amongst theorists (Scribner & Cole, 1981; Eisenstein, 2013; Erimann, 2010; Finnegan, 2002; Furniss, 2004; Goody, 1977; Logan, 2004; McLuhan, 1994; Olsen, 1994; Ong, 1986, 2012; Poster, 1995; Postman, 1992) that the separation of ways of knowing into pre-literate and post-literate is overly simplistic, unnecessarily polarising and an implicit acknowledgement of an erroneous primitive versus civilised dichotomy.

Recent scholars, theorising from sociocultural and critical perspectives, and writing particularly in the field of adult literacy, have called for a redefinition of literacy that focuses on everyday social events and 'out of school' contexts (Lankshear & Knobel, 2006; Street, 1995, 2001). These 'New Literacy' theorists argue that literacy encompasses all "socially recognised ways of generating, communicating and negotiating meaningful content through the medium of encoded texts within contexts of participation in discourses" (Lankshear & Knobel, p. 64).

The New Literacy theorists are particularly concerned with refuting the idea that literacy is a technical process of mastery of textual forms of communication. Instead they argue that literacy is always a social "situationally specific" (Coiro, Knobel, Lankshear, & Leu, 2008, p. 5) practice that is embedded in socially constructed epistemological principles and power relations. From this perspective the nature of literacy always varies from one cultural and social context to another. These theorists claim that literacy practices can be seen as 'literacy events' that include any occasion where text is integral to the communication.

Street (in Collin & Street, 2014) also argues for a less deterministic, more culturally sensitive or ethnographic view of literacy. According to Street, literacy, like culture, is an active process of sense making carried out by human actors who read, write, speak, think and listen. He takes an emancipatory view of both literacy theorising and literacy practice, claiming that it is important for different cultural groups to define their own forms of literacy. He is particularly concerned that literacy is increasingly associated with mastering technology.

Ong's (1977a, 2012) research into literacy had a very different focus from that of the New Literacy theorists. He approached literacy from a phenomenological perspective, and claimed that the shift from orality to literacy changed noetic functioning at the deepest ontological level. His research interest was tracing and analysing the deep noetic influence of visual forms of media. Despite his fundamentally different focus, he too took an emancipatory position in relation to the hegemony of literate forms of knowing. His view was that text, especially mass-printed text, has changed consciousness in Western, post-Gutenberg societies, without those societies being conscious of the change, and that profound ways of knowing that were available in preliterate times were lost in this unconscious process.

Lankshear and Knobel (2006) have researched how literacy practices are changing as a result of digitisation. They call for a redefinition of what it means to be literate in the digitised literacy environment, arguing that digital literacy involves social skills such as interactivity,

responsiveness and sharing of resources and expertise, and a disposition towards collaboration. They recognise the potential of emerging digital technologies such as blogging and the use of wikis for learning literacy, and champion the incorporation of these 'out-of-school' cultural practices into school literacies.

This research is not concerned with a detailed differentiation between oral and literate ways of knowing. Its focus is on investigating the profound, but rather arbitrary, influence on human consciousness (Eisenstein, 2013; Goody, 1977; McLuhan, 1994; Ong, 1977a, 2004, 2012; Postman, 1992, 2000) of the technological processes associated with the production, consumption and distribution cycles of mass print, and considering the emerging ways of knowledge in the increasingly digitised knowledge media of the future. The key point in theorising about knowledge and knowing over an extended timeframe of 60 years is to make the conceptual case that what is perceived to be valuable and true knowledge varies by era and by cultural perspective. This expansive historical view sets the stage for a broader understanding of knowing and knowledge than its literate forms associated with the medium of print, and in doing so provides a philosophical and theoretical lens for stepping outside the current literate mind-set and considering the possible epistemological beliefs of a post-print era.

2.3   Theorising about digital epistemologies

While differentiating the knowledge stages of the past is useful in terms of developing an awareness of how current representational, analytical epistemologies are a phase rather than the only way of knowing, it is the knowledge stages of the future that are of greater interest for this research. An extended, historical view of knowledge offers a vantage point to not only look back at perceptions of knowledge in a time before literacy, but more importantly to consider how perceptions about valued and valuable knowledge might be mediated in a knowledge sensorium composed predominately of digitised forms of media.

The reason that McLuhan (1962, 1969, 1994) and Ong (1977a, 2012) have been chosen as the primary theoretical sources for this research is because they, of all the scholars in the field of media ecology who are discussed in this research, are the primary scholars who have looked into the future and speculated extensively about possible emerging epistemologies when the processes of digitisation become the dominant medium by which knowledge is stored and

shared. In making these predictions they have both made a number of sweeping claims about the future.

Both Ong and McLuhan refer specifically to the influence of electricity and digitisation in the emerging knowledge sensorium. In their speculations about the future they do not distinguish between electronic and digital media. Ong describes the emerging increasingly digitised knowledge environment as a "technological stream" (1973, p. 16). Although he refers to this stream as being electronic in nature he also refers to computers as being an electronic medium. For example in 1973 he wrote, "So today, with the arrival of electronic media of communication printing gives no real signs of going out of existence. One of the products of computers is, in fact, the print-out" (1973, p. 15).

McLuhan also used the terms electronic and digital (in the sense that computers are inherently digital) interchangeably. In 1969 he wrote:

> The electric media are the telegraph, radio, films, telephone, computer and television, all of which have not only extended a single sense or function as the old mechanical media did– i.e., the wheel as an extension of the foot, clothing as an extension of the skin, the phonetic alphabet as an extension of the eye–but have enhanced and externalized our entire central nervous systems, thus transforming all aspects of our social and psychic existence. The use of the electronic media constitutes a break boundary between fragmented Gutenberg man and integral man, just as phonetic literacy was a break boundary between oral-tribal man and visual man. (p. 10)

He speculated that electronic media would mediate a new kind of interpersonal immediacy that had the potential to "instantly and constantly create a total field of interacting events in which all men participate" (1994, p. 248). The term digital is further defined with reference to particular examples of knowledge media in Section 3.2.

The restoration of dialogue as a profound medium of knowing has been the central focus of all of Ong's research (Farrell, 2000). It is important to note that this valuing of oral ways of knowing is very much a response to the post-Gutenberg hegemony of print. Ong's concern was that the spatial/visual analogues associated with the medium of print, when used un-reflectively, encourage closed system thinking and being that "slights becoming, depersonalises knowledge, and trivializes human communication" (Zlatic, 2011, p. 9).

In championing the epistemological virtues of orality as a way of knowing about the world Ong made a number of high-level claims about future epistemologies. He claimed that

electronic media had the potential to bring about considerable desirable sensory and epistemological affordances because they mediate knowledge as a total field that has the potential to "…eliminate the fragmented specialties of form and function that we have long accepted as the heritage of alphabet, printing, and mechanisation" (2012, p. 277). He (1977a, 2012) speculated that the emerging electronic communication age would have significant epistemological virtues because it would redress the sensory imbalance brought about by the intense visualism associated with the period of mass-printed pedagogical texts because knowledge would be increasingly mediated by the auditory sense.

In 1982 (Ong, 2012) described this emergence of the sensory experience of sound into the knowledge sensorium as the emergence of a 'secondary orality'. He claimed that this 'secondary orality' would be "…essentially a more deliberate and self-conscious orality" (p. 136) that incorporated writing and print to a greater extent. Ong predicted that this emerging secondary orality would be different to primary orality because it would incorporate an individualised self-consciousness that has been developed with the aid of writing and print but "possessed of more reflectiveness, historical sense, and organised purposefulness than was possible in preliterate oral cultures" (1977a, pp. 301-302). He positioned this reintroduction of the auditory as a 'rebalancing' of perception that would bring the whole globe into continual contact with all of itself at once which would minimise "in-group feelings" (p. 301).

In 1982 when Ong (2012) first wrote about the emergence of a new form of orality he was particularly conscious of the increased incorporation of television into the human sensorium (according to Ong television is primarily a visual medium because it accentuates images over sound) as opposed to radio and telephone—technologies that are reliant on sound to shape the sensory communication medium.

Ong's intense focus on the orality/literacy dichotomy can be perceived as a perceptual response to the particular technological constraints of his time. In the communication period in which he lived (1912-2003) the spoken word was the only means by which people were able to come together and form close, mutually influential, interpersonal agreements. At that time mediated communication was perceived as mass-communication, and mass-communication did not have the capacity for extensive feedback loops. Consequently the only opportunity for achieving deep mutual understanding and empathy was by being in the physical presence of the other. This led to Ong's (1977a) perception that, "One cannot have voice without presence, at least suggested presence" (p.114). While there is significant research (Bakhtin, 1986; Farrell, 2000;

Ong, 2012; Wertsch, 1991) that indicates that the authors of written texts, in some form, imagine the audiences to whom their work is directed, it is only since the advent of more interactive forms of textual communication such as social media that it has become possible to deeply sense the presence of others through mediated communication other than through interpersonal talk.

Ong (1977a) acknowledged the methodological difficulties associated with investigating the ratio and balances between the senses and the nature of the individual sensorium. He said that for the most part historians have considered the effects of printing in an external fashion. For example, he says that historians have made large-scale statements such as "printing 'spread ideas' and made the text of the Bible available and put the Bible in the 'hands of the people'" (p. 264). He says while statements like these are 'true enough' historians have neglected to consider the change in psychological structures that are implicit in the shift of the word from a written to a mass-printed medium of communication. He said that "such full or exhaustive knowledge is not easy to come by, and we are a long way from it at the present" (p. 6).

Ong used degrees of orality as his primary methodological yardstick to diachronically theorise the difference between epistemological stages. As discussed in Section 1.5 he was primarily a scholar of literature who "came across" (Ong, 2002, p. 27) the role that form plays in mediating meaning. His "hunch" (2004, p. xv) about the epistemological influence of Ramism was developed by an extensive analysis of over 1000 texts that he analysed primarily from a literary point of view (2004). Through this close, literary analysis Ong showed how the spatialisation and quantification of thought in dialectic and logic has influenced Western epistemology.

Although Ong referred extensively and deeply to a range of diverse literary sources in his theorising, apart from his research into Ramism and some of his later literary criticism (1957, 1959), he did not delve deeply into primary texts (Professor Randolph Lumpp and Fr. Paul Soukup, SJ, personal communication, April 10, 2015). After his close analysis of Ramist texts his subsequent theorising about the evanescent nature of sound and the noetic influence of the visual form of mass printing was carried out on a broader, more macro scale. As his analysis of the 'talking' (oral element) of African drumbeats in (1977b) showed, his theoretical approach was often anthropological. He did not have the benefit of more recent, media oriented, methodological approaches such as multimodal analysis (Jewitt, 2004, Kress, 2003; Kress & Van Leeuwen, 2001) and mediated discourse analysis (Wertsch, 1991, 1998).

Despite the claim that Ong's development of the idea of a 'secondary orality' idea is "scattered, introductory and incomplete" (Lambke, 2012, p. 201), his ideas about this emerging phenomenon are widely debated (Nayar, 2012), particularly in the field of media ecology. A number of theorists (Street, 1995; Hobart & Schiffman, 1998) have specifically criticised Ong's (2012) tendency to draw distinctions between knowledge and knowing in primary oral cultures as opposed to literate cultures.

Street (1995) claims that Ong makes a number of sweeping generalisations, which are impossible to verify, about the "rational, objective and detached minds" (p. 156) of literates as opposed to those in oral societies. He describes Ong's methodological approach towards examining the past and the future as the 'if I were a horse' approach. Ong (1977a, 2012) himself recognised the methodological difficulties associated with attempting to examine orality from a vantage point of literacy. He was aware of the extreme perceptual limitations of this because "you cannot, without serious and disabling distortion, describe a primary phenomenon by starting with a subsequent secondary phenomenon and pare away the differences" (2012, p. 13). However, Ong was keenly aware that diachronic analysis offered valuable insight in terms of recognising affordances and constraints. According to Ong, most 'time-based' comparisons do not take into account "how matters stood before writing" (Ong, 1986, p. 17), therefore, despite his reservations about this methodological approach, he frequently referred to the past in order to illuminate the present or the future.

McLuhan also speculated extensively about the future. He wrote about the struggles he faced in his attempts to "glimpse" the future (p. 17), but that seeking new ways of knowing outside the constraints of his culture was like moving "from feet and wheels to wind and sails" (McLuhan, Molinaro, McLuhan & Toye, 1987, p. 23). However, the perceptual struggle and impossibility of anticipating the future did not stop him making a number of big claims about causality. McLuhan (1994) anticipated that the technological simulation of consciousness would extend the creative process of knowing to the whole of human society. He referred to this change as an emerging worldview of "wholeness, empathy and depth of awareness" and a "revulsion against imposed patterns" (p. 21). He claimed that:

> With the arrival of electric technology, man has extended, or set outside himself, a live model of the central nervous system itself. To the degree that this is so, it is a development that suggests a desperate suicidal autoamputation, as if the central nervous system could no longer depend on the physical organs to be protective buffers against the slings and arrows of outrageous mechanism. (1994, pp. 47-48)

McLuhan made it clear that he was more interested in the generation of new ideas than critiquing, documenting and disseminating them (Levinson, 1999). Rather than explaining how media influence perception he was concerned with overcoming their deterministic nature. In the Playboy Interview (1969) he talks extensively about his approach to methodology. He says, "I just sit down and start to work. I grope, I listen, I test, I accept and discard; I try out different sequences–until the tumblers fall and the doors spring open" (p. 3). He wanted to cut through ambiguity and "step outside the system" —as Strate (2008, p. 129) describes it, to gain perspective on the larger picture about the sensory influence of the medium.

McLuhan's research approach is highly interdisciplinary. He incorporates historical, literary, sociological and linguistic approaches in his theorising. He described this as a "mosaic or field approach to problems" (1962, p. i). According to McLuhan and Zhang (2013) McLuhan's modus operandi was the use of probes. He also recognised the validity of contemplation as an agent of change when he said, "There is absolutely no inevitability as long as there is a willingness to contemplate what is happening (McLuhan, Fiore & Agel, 1967). As will be discussed in Section 2.4.1, McLuhan used an analysis of metaphors as a way of anticipating the future.

One of McLuhan's later methodological strategies was the development of the Tetrad or 'Laws of Media' (McLuhan & McLuhan, 1988, p. viii). The Tetrad consisted of four laws, framed as questions, which could be applied to a wide spectrum of cultural elements. The development of these four laws was, in part, an attempt on McLuhan's part to develop a scientific basis for his theorising in response to his critics (McLuhan & McLuhan). Although the Tetrad provides a methodology for analysis of the influence of emerging sensory extensions it is still, in methodological terms, macro in its approach. Rather than close, example-specific analysis of sensory experience, the Tetrad is a heuristic or set of questions that aim to provide a vantage point from which the user may observe and reflect generally on the power of technologies so that they "do not push us around" (1988, p. 2).

Although McLuhan (1962, 1969, 1994) and Ong (1977a, 2012) are the most prominent thinkers in this field, particularly in terms of their claims about the future, it is important to note that they are not alone in their thoughts about the implications of the increasingly digitised medium on epistemology. A number of other theorists have anticipated that technically advanced societies are experiencing a profound transformation of cultural identity that will

result in individuals thinking and acting in entirely new ways (Goody, 1977; Levinson, 1999), and that the increasingly digitised knowledge environment will facilitate the emergence of more holistic and balanced ways of knowing (Cumberland, 2012; Gergen, 1985; Pettitt, 2009).

When both Ong and McLuhan theorised extensively about the future, they were thinking and theorising about epistemological change on a macro level. They were certain that the digitisation of the knowledge 'sensorium' would have far-reaching epistemological consequences but were not particularly concerned with supporting their claims methodologically. This research contributes to the development of a methodology to bring their big picture claims down to earth by developing a micro lens to investigate how sensory interaction with the material form of the knowledge sensorium is changing as the material form of the knowledge medium is changing.

2.4   The perceptual influence of the material substrate

As will be further developed in Chapter 4 this research develops a method for examining how close attention to the material composition of knowledge media (at all stages of their production, distribution and consumption cycles) is central to understanding their perceptual influence. An awareness of the role that material composition plays in shaping perceptions about knowledge is central to the philosophical field of media ecology. From a media ecology perspective the material composition of the knowledge 'substrate' (Hayles, 2005; Levinson, 1997) or medium—be it talk, text on paper, text on a screen, or images—has a powerful influence on perceptions of knowledge. As will be established in this research, this is because the material composition of the knowledge substrate choreographs how discourses flow through the medium: for example, the degree of spontaneity that the medium facilitates, the extent to which the discourses are constrained within one medium or across a range of media, and the extent to which the knowledge substrate facilitates the absence or presence of the others who are mutually engaged in coming to know. In other words, it is the sensory micro interactions with the unique material composition of the aggregated knowledge medium of the age that shapes perceptions of what is perceived as valid and valuable knowledge.

Levinson (1997), McLuhan (1962, 1994), Ong (1977a, 2004, 2012), Postman (2000, 2005) and Smith (2012) all theorise that thoughts, feelings and ideas transcend material form, and only through a particular material substrate do they become manifest. Central to a media ecology perspective is the idea that the form that is used to store and share knowledge changes the

nature of that knowledge at the deepest levels. At the heart of this theoretical perspective is the concept that the media by which knowledge is stored and shared are not neutral conveyors of meaning; they have the potential to twist meaning in subtle ways that are difficult to detect. From this perspective knowledge is always unique to a given individual—although it can be shared with others there is no possibility that what is in the mind of one individual can ever be replicated in the mind of another.

McLuhan (1994) claimed that the substrate of all media including talk, print and television (and, by implication, today's social media) have their own rules and conventions of meaning that result in a "total configurational awareness" (p. 7) that moulds modes of cognition, social structures and institutions in specific ways.

As stated in Section 1.4, the primary material form of the formal knowledge of the Western world for the past 500 years has been that of mass-printed text. This medium has profoundly influenced Western perceptions of knowledge (Fallon, 2010; Levinson, 1997; Kress, 2003; McLuhan, 1951, 1962, 1994; Ong, 1977a, 2004, 2012; Poster, 1995; Postman, 2005; Street, 1995; Williams, 1983). McLuhan wrote (1994) that when the form used to express knowledge changed from the spoken word to the printed word, knowledge assumed the properties of the two-dimensional world of text. The unique materiality of this two-dimensional representation of knowledge influenced perceptions of knowledge in a number of ways. For example, it gave the impression that knowledge had a fixed point of view (McLuhan, 1969) and that knowledge is a commodity with a material substance that could be bought or sold. According to Poster, traditional print culture, "by the materiality of the words on the page as compared with the evanescence of the word in oral culture, promoted the authority of the author as an intellectual and a theorist" (p. 379). According to Poster, long established perceptions about the concreteness of the medium of print have been central to mediating the transition of content from "cultural works into monuments and authors into authorities" (1995, p. 385).

The materiality of print also gave the impression that there is an intrinsic relationship between words and the things that words represent. This is a perceptual illusion because "words themselves are empty of meaning" (Kress, 2003, p. 3).

Another such illusion that arises from the material form of knowledge media is that knowledge has come to be commonly imagined as a tree-like structure with the most important content at the top. Goody (1977), Furniss (2004), Ong (2012) and Poster (1995) all observed that the

material form of mass-printed texts locates words on the page in hierarchical arrangements of lists and white space to give the illusion that knowledge is fixed and static. From a material perspective, when the spoken word became represented in two-dimensional form it became systemised, ordered, linear and its meaning is released gradually as the reader moves through the text (Levinson, 1997). For example, when reading a text, as opposed to participating in a conversation, the order of things is important: the first item is always subconsciously more important than the subsequent, and the reader is compelled to follow a sequential reading path in order to make meaning.

Poster (1995) also studied the material attributes of books to examine the epistemological values that are mediated by mass-printed media. According to Poster, the features that are now attributed to modernist epistemologies were a perceptual response to the primary communication technology of the time: print. For example, Poster claimed that the belief that new knowledge could be arrived at as a result of individual reflection and reasoning came about as a result of the idea that coming to know (as a result of the materiality of the printed book that called for individual rather than communal engagement) was a private, reflective activity that was situated indoors. According to Poster the "…spatial materiality, linear display of sentences, stability of words on page, systematic spacing of black letters on white background..." (pp. 377-378) were all deeply influential in development of the belief that the process of coming to know involved a critical individual operating in isolation, making rational and thoughtful decisions. Poster also claimed that engagement with the material properties of text was essential for forming the elaborate analytic categories that are evident in typographic societies because it structured knowledge as distant from lived experience.

Street (1995) acknowledged the significance of the materiality of the medium when he wrote that the material process of writing contains unspoken ideologies of power and alienation, and that transferring ideas from one medium to another shifts the meaning at deep epistemological levels, "…raising questions about truth, what is knowledge and what are sources of authority" (p. 15). Street is referring directly to the role that materiality plays in shaping perceptions about the value of some knowledge over other knowledge when he states that "…when a piece of writing appears in an academic journal, its standing and the attitude the reader brings to it, rests on more than 'lexicalisation' alone: the status of the journal itself, even the quality and style of the paper and covers, all contribute to the 'meaning' of the propositions contained within it and to the degree of attention it is deemed to deserve from an 'academic' reader on the one hand or,

on the other, whether it is worth a lay person bothering to look at all" (p. 170). In other words, the content of a well-produced textbook with a Cambridge University Press imprint is perceived to be of higher value than a scruffy pile of computer print-outs, even though the content in both cases may be exactly the same.

Acknowledging the deep influences that mass-printed text have had on perceptions of knowledge can be intellectually challenging for people with a literate mind-set, reflecting the difficulty of stepping outside the conditioning of years of exposure to the representational forms of literacy. McLuhan (1969) likened the perceptual difficulty of perceiving a world outside the noetic influences of print to the difficulty the fish faces in attempting to perceive water. Ong (2012) also wrote that the rich communicative and epistemological potential of the spoken word is hard (impossible even) for literates to grasp and that, to literates, communication via the medium of orality, as in primary oral societies, may seem backward and unnecessarily redundant.

There is widespread intellectual agreement that coming to know is a process of interpersonal, dialogic communication rather than a process of cognitive engagement with an objective reality (Berger & Luckman, 1967; Bernstein, 1996; Gergen, 1985; von Glasersfeld, 1995; Wertsch, 1991, 1998; Vygotsky, 1962). Not only is the fundamentally dialogic nature of all knowing hard to perceive but the evanescent material form of talk fundamentally shapes the knowledge values mediated by it. The knowledge mediated by talk is generally spontaneous and deeply transactionally influenced by the presence of the other person (or people) also engaged in the knowledge act. Therefore, when knowing was primarily mediated by the spoken word, separating the object and the subject was not perceptually possible (Ong, 1977a). The possibility that the perceptual separation of object and subject, which fundamentally underpins knowing in the medium of mass printing, is a construct arbitrarily mediated by the affordances of that knowledge medium is intellectually challenging because intellectual detachment is central to the idea that the objective, external world is real and stable.

Ong (2012) attributed oral ways of knowing with the highest epistemological status because the interpersonal connection that occurred when, from a material perspective, two (or more) people were in the sensory presence of each other introduced a depth and significance into the knowing that was just not possible when the knowing was an 'I-it' relationship mediated by print. Ong believed that achieving the deep interpersonal connectedness associated with 'I-thou' (Buber, 1987) communication was the purest form of knowledge and that this way of

knowing had significant epistemological affordances because it allowed for deep engagement with the imagined other who was also engaged in the knowledge or knowing process.

Street (1995) was critical of Ong's (2012) tendency to sentimentalise oral ways of communicating and challenged his claims that oral ways of knowing represent an ideal of human wholeness. Street also claimed that there is more than one valid type of experience of literacy because language and discourse are always embedded in situated social practice and can never be separated from the particular social context in which they occur. He called for a recognition of literacy practices that encompass both speaking and writing, pointing out that most literacy situations call for both oral and written skills: for example, in academic seminars we take notes, we read and we talk.

2.4.1   Knowledge metaphors: Revealing the significance of material form

This section has a number of examples of knowledge metaphors that were collected while engaging with mass-printed knowledge media, in casual conversation and while engaging with Wikipedia over a period of several months. Close attention to the metaphors associated with knowledge and knowing is used in this section to support the claim that a vein of materiality underpins perceptions of knowledge, and that examining the material composition of the knowledge medium is a valid place to look for answers to the research question.

A random selection of examples of metaphors associated with the era of mass-printed text shows that knowledge is generally talked about as though it has material substance. Talk about knowledge has led to the general perception that it is possible to 'have' or 'acquire' a 'body of knowledge'; it is complimentary to describe knowledge as 'well-structured', 'rigorous', 'dense', 'deep', 'enduring', with a 'key point' and with a 'polished argument'. It is possible for knowledge to 'contain a kernel of truth'. Knowledge can be 'mastered', it is productive to 'forge an understanding', ideas can be 'carefully structured', and it is desirable to achieve 'the highest level of understanding' or a 'balanced view'. Knowledge can exist on a 'platform' and valuable knowledge has a 'tight, cohesive' argument. It is a positive thing to 'strengthen the argument' and 'come to grips' with an idea or 'set the record straight'. It is possible to 'instil' knowledge. Shared agreement about meaning is described as being 'on the same page'. Even the terms a 'measured' approach and 'set' the agenda imply materiality. Satisfaction that knowing has been achieved can be expressed with 'that's settled' or 'that's clear'.

Also from a material perspective it is derogatory to describe knowledge as 'soft', 'lightweight', 'nebulous' or 'flimsy'. If an argument is not well established it can be 'torn apart'. To say that knowledge is derived from 'word of mouth', if 'cracks are appearing', or if an idea is 'fluffy' implies that knowledge has little value. It is an insult to be called a 'spin-doctor' because spin is seen as lacking in substance. When knowledge is perceived as incorrect it is described as a 'distorted picture'. When someone is 'mouthing off' they are engaging in an ill-informed rant or they are full of 'hot air'.

Such metaphors can provide insight into future perceptions of knowledge through their ability to translate experience into new forms by "…elucidating a lesser-known area and relating it to an area that we know well to make equal what is new" (Levinson, 1999, p. 27). Lakoff and Johnson (1980) claim there is a fundamental link between human sensory experience, thought processes and metaphor. Metaphors challenge our sense of the taken for granted and provide a link with new ways of thinking (Gergen, et al., 2009; Lakoff & Johnson, 1980).

An analysis of the metaphors associated with increasingly digitised knowledge media reflects how the material form of the medium of knowledge is subtly changing. Emerging knowledge metaphors are indicating a less stable perception of knowledge, particularly in the talk of the young who are "…the cultural harbingers of our cultural mind-set" (Turkle, 1995, p. 82). From a sensory perspective, the acoustic sense is creeping into knowledge metaphors. For example, new knowledge is described as 'chiming' or 'resonating'.

An analysis of emerging knowledge metaphors indicates the possibility that the perception of 'knowledge' as a noun is becoming anachronistic. Rather than knowledge being referred to as an inert mass, knowledge and knowing are increasingly being discussed in terms of actions or "doings" (Ong, 2012, p. 43). 'Playing', 'fiddling', 'linking' and 'bouncing ideas around', 'navigating', 'balancing', 'connecting', 'intuiting' and ideas 'feeding into' other ideas are all metaphors that describe emerging ways of engaging with knowledge. Now it is desirable to 'grasp a new idea', 'wrap your head around this' and 'harvest possibilities' and 'migrate' ideas from one medium to another. State of the art knowledge tools are described as 'interactive', 'reflowable' and 'adaptable'. 'Fluidity', 'flexibility', 'ripples', 'refresh' the screen, 'stream' content, give a 'nod' to something, 'bricolage' and 'skim' are all metaphors based on a more fluid material engagement with knowledge.

The analysis and epistemological power of metaphors are central to the field of media ecology. McLuhan used an analysis of metaphors as a way of anticipating the future. His famous (1969) metaphor of 'surfing' anticipated the sensory experience of knowing in the digital age. According to Levinson (1999), the evolution of media since McLuhan's death in 1980 has significantly increased the appropriateness or validity of his metaphors in the contemporary communication environment.

As the analysis in Chapter 5 will show, Ong's prediction that knowing and knowledge are becoming an interaction or "doing" (2012, p. 43) in the digital age is likewise being reflected in the Wikipedia knowledge medium where there are frequent metaphorical references to knowledge as a process of interaction (located in the social world) rather than as a noun. For example, knowledge can be or 'mashed up' and there are frequent cautions against 'vandalism', 'edit wars' and 'dumping'. The close sensory analysis of the three examples of knowledge media in Chapter 5 confirms that there is a direct connection between these emerging knowledge metaphors and the changing sensory experience of knowing as the processes of digitisation influence sensory engagement with knowledge media.

2.5   Some ways of knowing more profound and more valid than others

As stated in Chapter 1, this research is about knowledge and knowing. The specific question that this research addresses is: how do knowledge media shape perceptions of knowledge? As was developed in the previous section, the methodological position that underpins this research is that close analysis of the material form of the knowledge medium can show how the medium of knowledge shapes perceptions of knowledge. As discussed in Section 2.1, from a media ecology perspective, the sensory experience of the medium by which knowledge is stored and shared influences the extent to which some ways of knowing are perceived as truer and more valid than other ways of knowing. Implicit in this approach (and implicit in a media ecology perspective) is a value judgment about knowledge because it suggests that some ways of knowing about the world are more profound than others.

Ong (2012) approached his theorising about knowledge from an emancipatory perspective. He theorised that ways of knowing mediated by interpersonal communication are more profound ways of knowing than those mediated by typography.

The acknowledgment of the centrality of the interpersonal in coming to know is what Ong was referring to when he said that in all knowledge transactions there is always an 'us' and is what Gergen (2009) meant when he said that all communication, even communication that occurs via the medium of text, is embedded within a tradition of "…act and supplement" (p. 97). From Ong's perspective mass-printed text has had a limiting and narrowing influence on perceptions of knowledge and "liberating our text-bound minds" (Ong, 2012, p.153) was the primary route to truer and more valid knowledge.

McLuhan (1962) claimed that he was medium-neutral and he tried not to pass judgment. He claimed that his primary motivation was to show how deeply the medium influenced perception so that the medium could not "push us around" (p. 2). Although he claimed to be medium-neutral, he clearly perceived communication that was mediated by mass-printed text as epistemologically limiting. Value judgment is implicit in what McLuhan (1962) meant when he said that when Gutenberg's technology of mass print filled the world, the human voice closed down and people began to read passively as consumers of knowledge, and the experience of coming to know as an individual was positioned as a solitary engagement between the learner and the text.

The acknowledgement that knowing is anchored in the social world rather than in a fact-based, external reality is central to two closely related philosophical theories of knowledge: social constructionism (Gergen, 1985; Gergen, Schrader & Gergen, 2009) and social constructivism (von Glasersfeld, 1995; Vygotsky, 1962; Wertsch, 1998). From both of these theoretical perspectives, all knowledge, including scientific knowledge, is arrived at through tacit social agreements about the world using social and symbolic communication that has been reported, represented or recorded in some form.

Despite the commonality in their names, there are considerable differences between these two scholarly approaches to knowledge in respect of the role of social engagement. From a constructivist perspective (Vygotsky, 1962), the cognitive process of arriving at mutually agreed understandings is at the heart of the process of coming to know. Vygotsky empirically examined knowing and knowledge from a small scale, 'micro' perspective, not because he was uninterested in large-scale social and cultural knowledge, but because he theorised that social and cultural knowledge is arrived at as a result of numerous, repeated acts of individual cognition and micro interactions with tools (with talk being perceived as a tool). These micro acts of individual cognition with tools have become the "patterned practices" that Poster (1995,

p. 67) states spiral out to shape normative perceptions about knowledge. It is important to note that while Vygotsky explained how individuals form cognitive concepts, he did not discuss how value was placed on these concepts. From this constructivist perspective, the mutual engagement between knowledge seekers and tools is a process of cognitive development that aggregates into wider, normative social and cultural knowledge.

Social constructionism advocates (Gergen, 1985; Gergen et al., 2009) similarly claim that knowledge is socially constructed through interpersonal engagement with others, but are concerned with the emancipatory potential of intellectually coming to understand that all perceptions of value and validity in the world are a product of socially shared agreements. This theoretical framework claims that the natural world is ontologically neutral and that value is attributed via the communication of shared agreements.

The social, interpersonal aspects of coming to know are also central to Lave and Wenger's (2002) research into the developmental transition from the knowledge of the novice to the knowledge of the expert. According to Lave and Wenger, the transition from novice to expert is a process of socialisation within communities of practice where participants share ideas and experiences over extended timeframes. Central to this perception of knowing is the significance of social interaction with more knowledgeable others within a situated context. Lave and Wenger point to the deeply interpersonal nature of knowledge when they claim that all aspects of knowing associated with communities of practice are formed in local and mundane ways, and that even technical knowledge relies on personal credibility as a key source of authority. According to Ong (2012), engaging with knowledgeable experts in a process of apprenticeship is a feature of learning in all cultures, but it is particularly evident in primary oral cultures.

The idea that all knowing originates in the unstructured, rather chaotic, social world of people can be highly intellectually challenging to literates who have been fully immersed in the medium of print since birth because it raises a number of intellectual perturbations. For example, if knowledge is a socially constructed human creation then it must be in a constant state of change. How then is it possible to master knowledge and, if knowledge is always an individual construct, how can knowledge be collectively represented by mass-printed texts, and how is it possible to achieve universal truths?

Given that all contemporary philosophical theories of knowledge and knowing claim that coming to know is a social process (Gergen, 1985; Gergen et al., 2009; Wertsch, 1991, 1998;

Vygotsky, 1962; von Glasersfeld, 1995) and that the social aspect of knowledge is implicit in sophisticated ways of knowing about the world, it is concerning that the interpersonal, relational aspects of knowing are not accorded higher status in formal classroom learning by either students or teachers. The knowing that is associated with 'human-to-human' social interaction (such as conversation, and peer-to-peer engagement) is frequently dismissed as anecdotal, lacking in substance and a mere 'story', is rarely allocated formal teaching time, and is generally not assessed.

Media ecology, as a theoretical position, does not dispute the idea that knowledge is socially constructed. However, instead of this process being primarily cognitive as Vygotsky (1962) and Piaget (1964) claimed, or about forming shared agreements through discourse as social constructionists (Gergen, 1985; Gergen, et al., 2009) claimed, media ecologists consider that the deepest level by which knowledge about the world is formed is through sensory engagement with the phenomenal environment. From this perspective, the medium that facilitates the social interaction that social constructivists and constructionists perceive as being at the heart of meaning-making is not only a vehicle for carrying content, but is also a powerful component in the sense-making process. In other words, the nature of the knowledge or knowing is always contingent on the sensory experience of engagement with the knowledge medium or the immediate sensory knowledge environment.

Of particular significance for this research is that, from the perspective of personal epistemological beliefs (as discussed in Section 1.3) sophisticated ways of knowing are aligned with constructivist perspectives. In other words, sophisticated ways of knowing are situated in dialogue. According to Hofer and Pintrich (2002), regardless of the number of stages, positions or perspectives, the sequence of development "…invariably suggests movement from a dualistic objectivist view of knowledge to a more subjective, relativistic stance, and ultimately to a contextual, constructivist perspective of knowing" (p. 7). Sophisticated knowing involves a recognition that knowing is always, at a deep level, a process of interpersonal, dialogic communication rather than a process of cognitive engagement with an objective reality, and everything that is assumed to be real in the world is actually constructed by engaging in shared socio-cultural activity (Berger & Luckman, 1967; Bernstein, 1996; Gergen, 1985; von Glasersfeld, 1995; Wertsch, 1991, 1998; Vygotsky, 1962).

The important, and rather controversial, point for this research is that each of the personal epistemological beliefs about knowledge that were theorised about by Hofer (2000, 2001),

Hofer and Pintrich (1997, 2002), Schommer (1990, 1993a, 1993b, latterly Schommer-Aikin, 2012) can be perceived on a scale ranging from naive to sophisticated. Learners who have unsophisticated or naïve epistemological beliefs view knowledge as absolute and handed down by authority, whereas those with sophisticated beliefs perceive knowledge or knowing as a complex and provisional process. According to Schommer-Aikin (2004) personal epistemological beliefs, particularly amongst younger students, are generally positioned towards the naïve end of the epistemological continuum and only a relatively small number of students ever achieve sophisticated beliefs about knowledge. Students with such sophisticated beliefs consider (even unconsciously) that knowing is situated in the messy, unstructured world of dialogic interaction, rather than in the world of stable, systemised, authoritative texts.

The central issue raised in this section is that the sensory experience of knowing, as mediated by mass-printed knowledge media of the age of literacy, are mediating epistemological beliefs that are at odds with the social nature of sophisticated and philosophical beliefs about knowing. From a media ecology perspective the sensory experience of knowledge, as mediated by the technologies of mass print have masked the fundamentally social nature of knowledge.

2.6 Summary of Chapter 2

This chapter developed the theoretical position that underpins this research: that the sensory experience of the material form of the knowledge medium privileges the perceived value and validity of some beliefs about knowledge over other beliefs about knowledge. This theoretical perspective is central to media ecology. From this perspective coming to know through the medium of mass-printed text has been profoundly epistemologically influential. As was discussed in Section 2.2 a number of theorists (McLuhan, 1994; Ong; 1977a, 2012; Poster, 1995) claim that the modernist assumptions that have come to be perceived as the right and true way of knowing about the world in the era of mass print are, in fact, merely a sensory response to the dominant knowledge medium of the time: mass printing. They make the theoretical claim that close analysis of the material form of the medium of knowledge can provide clues about why some ways of knowing are privileged over other ways. The important point, as discussed in Section 2.5, is that most philosophically accepted theories about knowledge and knowing recognise that knowledge is anchored in the social world, but that this scholarly perspective is not reflected in the commonly accepted media of pedagogical communication.

3   Focusing on the knowledge medium

Chapter 2 provided a theoretical context for establishing the central claim of this research: that the sensory experience of the knowledge medium's material form privileges perceptions about the value and validity of some knowledge over other knowledge. Chapter 3 focuses on the form, particularly the changing form, of the medium by which knowledge is stored and shared, and examines the literature about the role that material form plays in mediating beliefs about knowledge.

This chapter is divided into three sections. The first (Section 3.1) defines and explains 'knowledge medium' (or knowledge media), the term that this research uses to collectively describe the artefacts, tools, transactions or media by which knowledge is stored and shared. The second (Section 3.2) gives an overview of the changing material composition of knowledge media, beginning with the original knowledge medium, which is dialogic communication. It then discusses the incorporation of printing, particularly mass printing, into the knowledge sensorium. It concludes by describing some of the emerging changes in material form and in production trends that are occurring as the processes of digitisation are increasingly incorporated into the production, consumption and distribution cycles of knowledge media.

Observing these changes to the material form of knowledge media over an extended timeframe is an important aspect of this research, because the theoretical claim that underpins it is that the changing material form of the medium by which knowledge is stored and shared is subtly influencing epistemological beliefs. Examining these changes to material form beyond the intellectual perspective of the technological period of mass print is crucial to providing insight into the epistemological beliefs of the past and speculating about those emerging for the future. In addition, because the influence of form on meaning is a process of slow accumulation of "patterned practices" (Poster, 1995, p. 67), an extended observation period is required in order to detect ongoing changes in patterns.

The third section of this chapter (Section 3.3) reviews some of the key literature about the subtle, implicit influences of knowledge media, both mass-printed and digitised. This section makes the point that most literature about pedagogical knowledge media is concerned with content. It finds that most of the research into mass-printed knowledge media demonstrates a

negative influence on the sensory experience of coming to know. It examines the literature about pedagogical knowledge media from a media perspective and shows that, while there has been considerable research attention paid to digitised knowledge media, this same level of scrutiny has not been applied to the mass-printed equivalent. The final point is that this review of the literature reveals a dearth of research into how either mass-printed or digitised knowledge media have influenced beliefs about knowledge.

3.1   Knowledge media: Finding terminological coherence

Ong (2012) claimed that all knowing begins with thinking, but in order to store and share thoughts with others, these thoughts need to be organised into mutually accepted formats. Selecting a suitable term to collectively describe and discuss the mutually agreed formats that are used to store and share knowledge in a formal educational setting is becoming increasingly difficult because the material form of the knowledge medium is changing dramatically as it becomes increasingly digitised at all stages of its production, distribution and consumption cycles. The problem of terminological coherence (the problem, in this case, of referring to knowledge and knowledge tools over an extended timeframe) is central to this research because it highlights how the material form of knowledge is not constant, and how it shifts from age to age.

Given the wide variety of media that have been used to store and share knowledge, the term 'knowledge medium' (or 'knowledge media') has been chosen to describe them in this research and, in particular, to collectively describe the three examples that this research analyses in Chapter 5. This term was selected for a number of reasons. One is that the term 'knowledge medium' is sufficiently broad to include interpersonal communication within the definition. As claimed in Section 1.4, although textbooks are the most visible form of knowledge media, interpersonal communication is the universal and primary knowledge medium, although difficult to perceive. Recognition of the validity and affordances of interpersonal communication as a medium for storing and sharing knowledge is central to this research. The idea that all knowing is fundamentally interpersonal is what Ong (2012) was referring to when he claimed that all knowing begins with what someone somewhere said, and is what Ernest (1998) meant when he wrote that conversation is epistemologically basic in coming to know.

According to Ong (1977a, 2004), the use of the term 'knowledge media' to collectively describe the knowledge interactions associated with coming to know through interpersonal

communication is problematic. As was discussed in Section 2.3, Ong recognised that interpersonal communication is central to knowing, but he had conflicting and evolving views about the theoretical suitability of the term media, or medium, to describe this "real human" (2012, p. 177) communication. In 1977 Ong used the term when he wrote about "oral-aural or preliterate communications media" (p. 227), but later (2012) he specifically resisted using the terms 'media' and 'medium'—preferring 'sensory field' or 'consciousness'. At this later date Ong drew the distinction between mediated and 'natural' forms of communication when he wrote:

> Human communication, verbal and other, differs from the medium [sic] model most basically in that it demands anticipated feedback in order to take place at all. In the medium model, the message is moved from sender-position to receiver-position. In real human communication, the sender has to be not only in the sender position but also in the receiver position before he or she can send anything. (p.173)

Here Ong is claiming that there is a clear distinction between transactional, interpersonal forms of communication and mediated forms of communication. He perceived the distinction between these two forms of communication as being pronounced. He was disparaging about the term media when he wrote "…a willingness to live with the 'media' model of communication shows chirographic conditioning" (p.177). In using 'chirographic conditioning' Ong was referring to the decontextualised, transmission-based forms of communication that have come to be perceived as epistemologically appropriate in the era of mass printing. From this perspective, mediated forms of communication can constrain and limit the flow of communication through one-way, mass-delivered, generalised messages, whereas natural or interpersonal communication involves subtle, relational and transactional interactions.

Despite Ong's (2012) doubts about the appropriateness of the term 'medium' to collectively describe a broad continuum of knowledge transactions, including both interpersonal, dialogic transactions and the knowledge transactions associated with mass-printed media, this term is deliberately applied in this research to emphasise that the distinction between mass and interpersonal communication is breaking down. The decreasing distinction between 'natural' and 'mediated' forms of communication is an important point of discussion because, as this research will show in Chapter 5, with the advent of social media the sharp distinction between interpersonal and mass-mediated communication is disappearing.

Ong's (1977a, 2012) perceptions of this distinction and his subsequent resistance to the use of the term 'media' can be interpreted as a consequence of the particular perspective of the times

in which he lived. Ong was born in 1912, and grew up in a period in which mass communication had limited feedback loops and was almost always limited to a one-way flow of information. Early forms of radio and then television provided limited opportunities for listeners and viewers to influence content. As the analysis in Chapter 5 (in particular the discussion in Section 5.4.2) will show, textbooks from the 1960s (and earlier decades) had similar limitations. In other words, Ong's experiences of 'media' were markedly different from the transactional interaction associated with interpersonal communication, and from today's experience of increasingly highly socially interactive forms of media.

From a standpoint in the early 21st century, Ong's (1977a, 2012) distinction between mediated and interpersonal (transactional) forms of knowing is becoming increasingly artificial as it breaks down with the emergence of the interactive capacity of social media. The increased capacity for feedback loops in emerging forms of media is reducing the distinction between interpersonal and mass media. In this environment, the term knowledge media can therefore be used in this research to describe both mass media and 'natural', interpersonal media.

McLuhan used the words medium, media and technology interchangeably. He first introduced the phrase 'the medium is the message', originally published in 1964, in his book *Understanding Media: The Extensions of Man* (McLuhan, 1994). It quickly became a highly controversial aphorism, and he spent his academic life explaining what he meant by this term. McLuhan used the term 'medium' in a broad sense. He perceived the medium as any extension of ourselves, or more broadly as any emerging technology. The key point is that for McLuhan the significance of the medium lies not in its content but rather in its material characteristics, and how these refract communication and spiral outward to influence ongoing social and cultural perceptions.

Another term that could have been used to collectively describe the medium by which knowledge is transacted is 'tool'—a term used frequently in an educational context as a form of instructional technology that is mechanically manipulated by a human agent. This research takes a more nuanced approach to the relationship between the human agent and the medium of educational engagement. It takes what Sørensen (2009) describes as a post-humanist stance towards tools and the use of tools. This stance positions humans and their engagement with the tools of knowledge not above them as the creator, but "among the materials" (p. 2). From this perspective, tools are not separate from their users, but rather—through a process of mutual

interaction—they alter, subtly and incrementally, how humans live in the world and what they believe about the world (Wertsch, 1998).

The term tool potentially has considerable validity as a way of describing the form by which knowledge is stored and shared because this research considers tools (in this case, tools associated with the formal, classroom knowledge environment) from a much broader, more transactional, perspective. However, it was rejected because it does not adequately allow consistent reference to, and comparison of, the three materially diverse knowledge media being analysed in this research.

The first two examples of knowledge media analysed in this research are examples of the representational style of knowledge that has become familiar in the age of literacy—they are physical artefacts and, as such, can be described by familiar nouns such as books, texts or tools. However, 'tool' becomes terminologically inadequate when describing alternative ways of knowing such as those in the oral age where knowing was a markedly different experience. Ong (2012) described coming to know in the era of orality as "doings" (p. 43), or acts of interpersonal engagement.

Not only is 'tool' not a good fit with conceptions of knowing in the oral age, but also (as the analysis in Chapter 5 will reveal) the term is increasingly inappropriate as a means of describing acts of engagement with knowledge media in a digitised environment in which media such as Google, Wikipedia and Facebook predominate. In the digitised environment, the act of engagement with knowledge is no longer confined to prescribed, standalone representations of the world that are anchored to the printed page. Instead, knowledge-seeking behaviour is becoming a much more participatory, dynamic series of interactions that, as this research will indicate, are still primarily text-based but are now digitally mediated by a screen, and increasingly involve engagement with people rather than texts. This kind of engagement with knowledge is much harder to describe using terminology of a previous era. Therefore, in order to ensure terminological coherence across time, the corpus of artefacts being examined in this comparative analysis is referred to from this point on not as tools, texts or artefacts but as 'knowledge media.'

The term 'knowledge media' (or medium) is used to describe both the corpus in this research and the wider genre of pedagogical media. It is sufficiently broad to apply to all ages, ability levels and curriculum subjects. As a genre, the three knowledge media selected for analysis in

this research have sufficient material similarities to allow them to be discussed collectively regardless of whether they are targeting primary, secondary or tertiary level knowledge seekers. They are all written to a well-established formula: regardless of the age group they are targeting they are all chosen by someone other than the knowledge seeker, they have been selected to fulfil a need for a formal course of study, and they are each, to some extent, systemised or simplified for pedagogical consumption.

Clearly there is a continuum of courses that formally incorporate textbooks into their teaching programme. At one end of the continuum are courses that transmit a finite body of knowledge and skills and have a prescriptive (closed) set of learning outcomes that are generally set by external professional bodies. These courses often use the course textbook as a tool for applying detailed (and often frequently applied) assessments to track how students are meeting the course outcomes. At the other end of the continuum are courses which might be characterised as 'enquiry-based'—with more open-ended learning outcomes and less closely-defined knowledge and skills, where the capability to be creative, think critically and analytically, and to communicate about the results of enquiry are among the most important outcomes. However, no matter where along this continuum textbooks are positioned, as a genre they have sufficient common elements (discussed in the previous paragraph) to enable them to be described collectively by the term 'knowledge media.'

Chesser (2003), taking a tongue-in-cheek view of the uniting elements of textbooks, makes the point that textbooks are all, on some perceptual level, regardless of the age at which they are directed:

> …some version of a twelve-inch, seven-pound, hard-covered, glossy-paged, pulp doorstop. Third-grade math or graduate medicine, it is likely composed of many short units and peppered with colorful illustrations, tables, and exercises. It supports the study of a finite subject area, and it will very effectively fill the average backpack, if not the average brain. (p. 3)

Although Chesser (2003) takes a light-hearted view of the instantly recognisable format of textbooks, Ong (2004) views their universally recognisable form in a more sinister light. He says, "Even today, you can recognise at first glance any Ramist influence in a given book. It takes the form of elaborate tables of 'dichotomies' laid out across the page. Typically, these start at the left-hand side with the subject in question" and "each of these branches is further subdivided. And so on across the page, producing an elaborate tree structure that proliferates from left to right into ever finer distinctions" and "such a chart apparently maps out an entire

subject, presenting it to the eye as a coherent whole with parts clearly and distinctly arrayed in space" (p.vii). He points out that while this is a simple device that is commonplace today, in its day it was revolutionary.

In summary, despite the contested nature of the term 'media' and Ong's resistance to it, there are a number of reasons why knowledge media (or medium) was chosen for this research to collectively describe the tools, artefacts and transactions used in the storing and sharing of knowledge. First, the idea that talk and text can *both* be perceived as media by which knowledge is transacted is a point that is central to this thesis. Secondly, the term is broad enough to encompass the complex amalgam of activities, interactions or "doings" (2012, p. 43) that formed the act of knowing in an oral age, and that (as will be shown later in this research) are doing likewise in a digitised age. Thirdly, the term highlights the fact that, as will be discussed in Section 3.3, with the exception of the field of assessment, the educational community rarely examines the influence of pedagogical knowledge media from a media perspective: instead, knowledge media are generally analysed for their discourse or ideational content.

3.2   Knowledge media: Focusing on changes in form

This research is an analysis of how the material form by which pedagogical knowledge is stored and shared influences beliefs about the nature of knowledge. Therefore close attention to form is important, in particular how the form of contemporary knowledge media is changing as they become increasingly digitised. This section provides a brief overview of this changing form. Section 3.2 takes a historical perspective on changes of form by considering knowledge media in a time when the spoken word predominated. It then provides an overview of the material characteristics of the form of knowledge media in the age of mass print. It then clarifies what is meant by the term 'digitisation' in this research and focuses on key changes to Western knowledge media over the past 35 years as the processes of digitisation have begun to significantly influence their form.

It is important to note that the separation of pedagogical knowledge media into three distinct sequential phases (the interpersonal medium, mass-printed media, and digitised media) is artificial because all communication—including that mediated by mass print—is embedded, to some degree, in social interaction (Ong, 1977a); all communicators therefore employ whatever

modes of meaning-making that are available to them (Kress, 2003, 2009; Scribner & Cole, 1981; Street, 1995).

It should also be recognised at the outset of any review of literature about knowledge media that the market, the pedagogical environment and the cultural context in which these media are used varies greatly from country to country. Most of the research about knowledge media (both mass-printed and digitised) originates in the United States of America (US). The situation in the US is unique because its knowledge media (particularly mass-printed) are often specifically and openly chosen for political, religious and moral reasons (Dale, 2010; Lake-Corral, 2012; Provenzo, Shaver & Bello, 2011). This significantly influences both the content and marketing of knowledge media in the US because publishers need to be sensitive to the political and religious context to succeed in marketing their products (Wertsch, 1998). While mass-printed knowledge media also exert considerable social, political and religious influence in other parts of the Western world, this influence is generally implicit and knowledge media are not specifically designed or chosen with these aims in mind.

As discussed in sections 2.2 and 3.1, Ong (1977, 2012) regarded the spoken word as the original and primary knowledge medium. In other words, everything that was ever expressed in written form had once been spoken by one person to another and everything that was available to be read in books was a written record of what someone once said (Ong, 2012). From this perspective, dialogue—as experienced through conversing with other human beings—is the original knowledge medium, and therefore it is central to this research to consider the medium of interpersonal communication as mediated by dialogue to be fundamental in any analysis of knowledge and knowing.

The material form of dialogue as a knowledge medium is difficult to perceive and therefore theorise about because it is mediated by the sense of sound. Until the relatively recent invention of sound recording devices, knowledge mediated by sound was difficult to store and analyse. From a material perspective, sound as a knowledge medium is evanescent because it is only detectable as it is going out of existence (Ong, 1977a, 2012). According to Ong, no other sensory field resists stabilisation in the way that sound does.

Knowledge that is mediated by dialogue is different from knowledge that is mediated by mass-printed text because it is a mode of action rather than a visual representation of thought or dialogue, as literates perceive text to be (Ong, 2012). A significant element of coming to know

as mediated by the medium of dialogue is that, by definition, it requires the presence of a fellow interlocutor with whom to 'do' knowledge, particularly in order to develop and think the 'memorable thoughts' (Ong, 1977a) that are a component of knowledge storage in oral societies.

From the perspective that dialogue is a medium, formal Western pedagogical practice has always been a multimedia activity because, even in highly literate classrooms, the presence of the other person—'the us' (Ong, 2012)—who is mutually engaged in the knowledge transaction is a highly significant sensory element. Although the influence of the others—such as the teacher, fellow students or the author of the knowledge medium—has been on some level a sensory component of all formal pedagogical practice, the drawn out, one-sided production processes associated with mass print have perceptually minimised the others' influence in the sensory experience of coming to know (McLuhan, 1994; Ong). As a result of this sensory minimisation the deeply social nature of all acts of coming to know, including the processes associated with formal learning and teaching, have become difficult to perceive, and therefore have tended not to be valued.

This dialogic perspective of knowing is particularly significant in this research because, as will be further developed, there are indications that the beliefs about knowledge that are emerging in the increasingly digitised environment resemble some of the beliefs associated with knowing in an oral world, albeit mediated via written text rather than through face-to-face conversation. However, as will also be further discussed, Ong (1977a, 2012) makes the point that the nature of the emerging orality is different from the orality associated with preliterate times—rather it is a new sensory experience because it is mediated by electronic communication media.

According to Ong (1977, 2012), formal knowledge—particularly as perceived in Western society—is always a secondary representation. In other words, in order for dialogic, interpersonal communication to be widely, reliably and consistently disseminated, it needs to be coded into text and images, and corralled into agreed formats (such as books, posters, poems, television programmes, newspapers, cartoons, comics and films). These secondary forms are rarely a precise or natural fit for knowledge and, as the analysis in Chapter 5 will show, their contrived formats have deeply influenced how knowledge has come to be represented and perceived.

As discussed in the previous section, while the primary pedagogical knowledge medium is always the spoken word, from the point of view of perceptions of formal knowledge—particularly in the Western education system—the written word has become the most recognised medium for representing knowledge. Since the Enlightenment the most valued forms of formal knowledge in the Western education system have been highly systemised visual representations on paper using text as the primary mode of meaning-making, and Western epistemological perceptions have become deeply influenced by script (Ong, 1977, 2012). According to Postman and Weingartner, since the 16th Century mass-printed knowledge media fundamentally influenced perceptions of what it means to come to know (1969). Since that time mass-printed knowledge media have been the primary source of income for book publishers, and since that time the image of the isolated student who reads and studies by himself has formed the primary conception of scholarship.

Prior to this, according to McLuhan (1962) and Ong (1977, 2012), during antiquity and the Middle Ages a transitional phase occurred where perceptions of knowledge were primarily oral but influenced by script. McLuhan considered this phase to be not particularly epistemologically profound (p. 94). As was discussed in Section 1.5, prior to the advent of the printing press Western text-based knowledge media consisted of original, one-off precious manuscripts that were painstakingly and individually handcrafted by elite scholars. These knowledge media were read aloud, usually to groups of listeners (Fischer, 2003).

The book in codex form and printed on paper dates from the 15th century when the mechanical printing press facilitated the mass-production of printed media (Fischer, 2003). This research focuses on a specific subset of printed media: pedagogical knowledge media. Since the advent of the printing press, there have been ongoing minor variations in the material form of mass-printed pedagogical knowledge media—for example primers, spellers and basal readers—but overall formal mass-printed representations of pedagogical knowledge have an instantly recognisable, standardised format. Kress (2003) describes them as coherent bodies of knowledge presented in the mode of writing. They are all representations of the world as expressed primarily through words printed on paper; they are all designed to be used in a particular formal field of study; and they all have a highly structured, carefully ordered layout in which the content is broken down into hierarchical, pre-established, carefully sequenced subsections. Each content area has been systematically laid out in individual pages and reproduced en masse using largely traditional mechanical processes. Each medium, to a

varying extent, uses a range of modes (such as images, diagrams and variations in font sizes) to support learning, and all mass-printed knowledge media use alphabetic text as the primary medium of communication. Students who used these knowledge media were generally expected to confine their studies to one primary medium that was generally referred to as the 'prescribed text'.

Textbooks as systemised forms of mass-printed knowledge media have become deeply interwoven with Western pedagogical practice over the past 500 years. Callison (2003) argues that they have become highly pedagogically powerful and that "no other instructional technology has had more influence on teaching over the past 100 years than the textbook" (p. 31). He says its primary epistemological power lies in its capacity to place all students on the same page at the same time. He claims that textbooks have been more influential than blackboards, worksheets, and computers because they have normalised the idea that it is appropriate for students to step through content at a similar pace, and to absorb and 'master' identical content.

As was discussed in Section 1.5, in the late 15th century the introduction of mass printing led to a period of intense change in the material form of knowledge media. Until the advent of electronic publishing in the late 20th century, the general form of mass-printed pedagogical knowledge media did not change significantly from the original Ramist textbooks (as discussed in Section 1.5). As the analysis of the changing form of knowledge media in Chapter 5 will show, this is a similarly disruptive period of change.

After a 500-year period of relative stability that lasted from the Enlightenment till the mid-1980s, the past 35 years have seen dramatic changes in the material form of pedagogical knowledge media as their format changes from analogue to digital. For the purposes of this analysis, and in order to distinguish between mass-printed and digitised knowledge media, the term 'digitisation' is used to refer to the process by which diverse forms of information, such as text, sound, image or voice, are converted into a single binary code. Friedman (2006) refers to digitisation as "the magic process by which words, music, data, films, files, and pictures are turned into bits and bytes—combinations of 1s and 0s—that can be manipulated on a computer screen, stored on a microprocessor, or submitted over satellites and fibre-optic lines" (p. 71). Negroponte (1995) argues that the use of binary on/off, yes/no, or one/zero signals is the primary material factor that differentiates a digital knowledge environment from an environment that has been mediated by mass print.

Changes in material form are also directly connected to changes in production and distribution cycles. There is conflicting research about the state of the textbook market. Sales performance of mass-printed knowledge media appears to vary significantly from country to country. Some industry sources claim that the US tertiary textbook sector is experiencing a production boom that has not been seen since the early 1990s as digital versions of books are rapidly outselling the physical versions, and sales of textbooks that can be reconstituted as e-books or other digital versions have been growing at a rapid rate (Cooper, 2012; Schulz, 2013). McKiernon (2011), referring to the broader genre of books, predicted that by 2014, 25 to 50 percent of all books sold in the US would be e-books. In Australia, on the other hand, despite the increased number of digitised versions being sold, the printed textbook industry is reported to remain prosperous and tertiary educational publishing currently represents about 30 percent of Australia's publishing output (Horsley & Brien, 2013). According to Horsley and Brien, spending on tertiary textbooks in Australia remained reasonably constant from 2007 to 2010, and in 2011 over 3.1 million textbooks were published and sold in Australia in the tertiary education sector alone.

In New Zealand an industry source (M. Loveridge, personal communication, March 7, 2015) is predicting that the financial incentive to produce textbooks is rapidly declining. After years of being able to charge considerable amounts for textbooks, publishing companies are being forced to review prices, and prices for many classroom textbooks are remaining static or dropping. Publishers are no longer expanding their publication lists, particularly in the field of the humanities.

The changing market dynamics are forcing the big academic publishing companies to move rapidly to reconfigure their business models in order to maintain relevance (Milliot, 2012; Zekaria, 2014). Each of the major players in the knowledge media market have collectively invested more than a billion dollars in the past five years buying software companies and building technology-services divisions (Johnson et al., 2013). Most are moving from producing traditional print based textbooks into cloud-based content which includes tools that promote student engagement via online interactive assessments, simulations of experiments and cases, and tools that deliver automatically-marked content-based assessments.

Parallel with, and contributing to, changes to the business model are changes to copyright laws. Open Access Textbooks (OATs) and Open Educational Resources (OERs) are digital educational resources that students can access at a much cheaper price online, and are rapidly

becoming a low cost alternative to prescribed, printed textbooks. Open source knowledge media such as CourseSmart™, VitalSource ™ and CafeScribe™ have emerged. They generally have a Creative Commons or GNU license that allows content to be reused and remixed to meet the explicit needs of their learners and course. Digitised knowledge media rental programmes are being trialled and licensed by institutions. There are predictions that it is just a matter of time before the majority of students will be using digital knowledge media assembled from free courseware, educational games, videos and projects from online sources (Snyder, 2009).

A number of consumer-driven initiatives are sidestepping traditional publishing models in favour of developing their own open-content learning management systems (Warren, 2010). For example, Next Generation™ is in the process of producing the first of several free titles that consist of content that has been crowd-sourced and FlatWorld™ publishes a range of knowledge media under a creative commons (open source) license. These open-content textbooks have developed a code of content sharing. This code maintains that it is the user's right to reuse, revise, remix and redistribute content to varying degrees (Wiley, 2008; Shelstad, 2011). For example, the catalogue of Flat World™ is published under the family of Creative Commons open licenses that allow authors to change the copyright restrictions of their work from the industry standard of 'all rights reserved' to an emerging model of 'some rights reserved.'

In the 1970s and 1980s most of the research into early forms of digitised knowledge media was centred on the influence of behaviourist approaches to knowledge (Schon, 1987, Chen, 2009). Many early educational software publishers produced digital knowledge media based on this approach, particularly in the curriculum areas of algebra, biology and chemistry (Chen). From the behavioural perspective, coming to know was a process of reducing knowledge to small, measurable, incremental segments. One of the reasons that behaviourism was as influential as a pedagogical approach was because it was cognitively conducive to the materiality of emerging digitised knowledge media. From this perspective, digitised knowledge media mediated the perception that knowledge could be assessed through highly specific performance objectives and motivated by (ideally positive) reinforcement.

As a result of the processes of digitisation, the distinction between textbooks and software became increasingly blurred. In the mid-1990s textbooks began to be increasingly promoted as 'multimedia' in their composition because they included accompanying websites, interactive

quizzes and other 'add-ons'. These multimedia ancillaries were often provided free to faculty, particularly when a textbook was adopted as a prescribed text for a particular course of study. Publishing industry claims that textbooks were accompanied by multimedia platforms were in reality frequently misleading as the accompaniments often amounted to little more than PDF versions of the print content that had been downloaded onto a CD.

In 2003 Kress wrote that the screen had replaced the book as the dominant medium of the current communication period. Although some digitised knowledge media comprise screen-based pages and give the impression of being similar to the pages of a book, this research establishes (see Chapter 5) that pages and screens have different affordances and constraints (a concept that is explained in Section 4.5), and mediate different sensory experiences of knowledge.

Kress (2003) claimed that the move from page to screen is changing knowledge media in two ways. The first is that digital publishing processes make it easy to use a wider range of modes such as photographs, illustrations, diagrams and varied font sizes to express ideational content (Bezemer & Kress, 2008; Jewitt, 2005a, 2005b, 2006, 2007, 2008; Jewitt & Kress, 2001). The second key influence of digitisation is that this environment is mediating increased potential for interactivity with others through embedded URLs that support multimedia capacity—for example, audio and video modes which connect more directly to blogs and other social media sites (Hayles, 2005; Kress, 2003). Knowledge seekers can now interact directly with authors through their Facebook pages, contribute through discussion forums, or 'chat' with teacher or classmates online.

This claim of increased interconnection with the others who are mutually engaged in knowledge seeking is central to this research. It analyses the validity of Kress's claims, but also takes them further by analysing the epistemological implications of these changes to the medium of knowledge.

The processes of digitisation are also mediating significant changes in the location of formal learning, as the dominance of universities as the primary cultural institution associated with storing and disseminating knowledge is decreasing (Ernst & Young, 2012). According to Levinson (1997) this is reversing the material trend towards education being located in a formal environment that began in the 11th century. This dislocation from the site of the school has recently gained significant momentum, with a survey of college presidents indicating that

more than three-quarters of American colleges and universities are now offering online courses as instructional alternatives to in-house teaching programmes (Parker, Lenhart & Moore, 2011).

YouTube has developed an external resource called EdxU that is an aggregate of all the educational content that has been uploaded by US universities and colleges, such as MIT's open courseware, and content from ITunes, TED Talks and Academic Earth. Typically the courses offered by platforms such as Coursera or edX provide students with all the necessary course materials, thereby displacing textbooks. Alongside these external resources, almost all Western tertiary educational institutions have now established in-house online learning management systems such as WebCT™ and Blackboard™. These in-house learning environments provide repositories of teaching and learning resources and support materials that are directly linked to library services, e-textbooks, reference books, journal readings, academic blogs and discussion lists. In many cases these digitised learning resources are bypassing standalone, prescribed, mass-printed course texts altogether, and increasingly minimising any involvement from textbook publishers.

Research into the changing literacy practices of knowledge-seeking teenagers indicates that instead of using a single, standalone knowledge medium, they are increasingly engaging with a diverse range of knowledge media (Fasso, Knight & Knight, 2013; Haven, 2009; Lenhart, Arafeh, Smith, & MacGill, 2008; Keller, 2013). At the tertiary education level, and particularly in the humanities and social sciences, there is a clear trend away from using prescribed, standalone textbooks (Jobrack, 2011). A report by Parker, Lenhart and Moore ("The Digital Revolution and Higher Learning," 2011) was based on two American surveys, one online and one by telephone, of presidents of 1,055 colleges and universities in America. These two studies found that students were using a variety of digital media in their assignments: 72 percent of students were using cell phones, 66 percent were using digital cameras, and 55 percent digital video recorders. According to Purcell et al. (2012), 94 percent of students reported that they regularly used Google or other online search engines, 52 percent used YouTube or other social media sites, and 42 percent discussed their study with their peers.

Multimodal theorists have analysed the extent to which the modal composition of the medium influences learning and teaching (Kress, 2003; Jewitt & Tsatsarelis, 2000; Levin & Mayer, 1993). Most research into digital knowledge media has focused on analysing the changing

modes of representation, particularly the increased incorporation of image into knowledge media (Horn, 1998; Jewitt, 2008; Jewitt & Kress, 2001; McLuhan, 1994; M, 1999; Postman, 2005). These theorists assert that image is playing a more dominant role in the modal composition of knowledge media. However, Kress suggested that although image is increasingly being incorporated into knowledge media, writing would remain the preferred communication mode of the political and cultural elite.

Contrary to these predictions, several large-scale research studies (Purcell et al., 2012; Haven, 2009) have shown that text continues to be the primary medium for storing and sharing knowledge across American society. Research conducted with Stanford university students (Haven) analysed the changes in students' everyday engagement with text mediated by digital technology, and found that the students in fact used text as a medium of communication more than any previous generation. Haven found that the average teenager sent over 3000 short message service (SMS, or 'txt') messages each month, and that these digitised forms of writing showed a deeper richness and complexity of meaning than the formal, paper-based writing that had been the staple of students in previous generations, and that was often unimaginative and formulaic. Haven's research also indicated that the clear distinction between the informal types of writing used in the online environment and formal writing was breaking down.

Wikipedia has recently emerged as an emancipatory knowledge movement (Leitch, 2014) in which knowledge is created by collaborative endeavours by interested parties. It is shared, edited and added to by a process of collaboration. Since it began it has gained extraordinary popularity as an informal knowledge medium. Wikipedia is the world's 6th most visited website (Alexa, 2015). There are 20 billion page views, 22.5 million contributors and 736 million edits in English alone across the Wikipedia 'movement' per month. This equates to the entire population of Australia (23.6 million) each contributing to Wikipedia 30 times per month (Lurie, 2014).

Until recently it was common practice for teachers to specifically exclude the use of wiki type references in formal assignments because it was perceived as a cut-down, non-authorised, easily accessible form of knowledge (Garriga, 2006; Hilles, 2014; Menchen-Trevino & Hargittai, 2001; Olanoff, 2007; Patten, 2005). There are a number of indications that Wikipedia is now rapidly achieving credibility as a valid and highly influential medium for engagement in the formal knowledge environment. In the survey discussed above (Purcell et al., 2012), teachers indicated that Wikipedia was the second most frequently used online tool behind

Google, and 75 percent reported that students used Wikipedia in their formal assignments. According to (Zickuhr & Rainie, 2011) even though some teachers continue to ban the use of Wikipedia for formal assignments, student use of Wikipedia as a source in formal classroom assignments has steadily increased. At a secondary school level an increasing number of teachers are formally incorporating Wikipedia into classroom assignments (Zickuhr & Rainie). This is also occurring at a tertiary level (Parker, Strickler & Banappagari, 2012), although Konieczny (2014) reported that academics perceive that there is little academic merit in incorporating Wikipedia into teaching or scholarship.

Digitised knowledge media have the potential to provide detailed and accurate data about student responses and behaviour. Increasingly personalised forms of digital knowledge media that have the capacity to measure a student's learning trajectory, response time, cognitive ability, learning speed and reaction level are being developed in order to create individual instructional paths. Young (2009) predicts that these digitised forms of knowledge media will incorporate more assessments and performance data into the knowledge medium, and that measurement of the aggregated performance data will enable publishers to develop more effective and personalised forms of knowledge media.

Research also indicates that a new kind of student engagement with knowledge media is rapidly emerging (Purcell et al., 2012). According to Kress and Van Leeuwen (2001), the increased sequencing and pace of interactions in the online environment is highly epistemologically influential. The affordances of hypertext are significantly influencing the way that knowledge seekers engage with knowledge media (Barnes & Strate, 1996; Brent, 1995; Levinson, 1997). Cognitive processing differs between printed media and e-readers, with readers reporting skimming computer-based text and searching for key terms rather than reading line by line (Rho & Gedeon, 2000).

The Kahn Academy is an innovative example of an emerging digitised knowledge medium (https://www.khanacademy.org), particularly in the fields of maths and science. It is growing in popularity with over two million viewed videos and approximately 500,000 registered subscribers in 2014 (Bauer, 2013). As a digital knowledge medium, it has a number of unique affordances compared with print-based knowledge media. For example, knowledge seekers using the Kahn Academy can start and stop at any point; the knowledge experience is personalised and self-paced; learners are not required to proceed to the next level until they are personally satisfied that they have effectively completed the previous level (in other words,

there is no such thing as partial success); and learners can repeat the learning experience over and over again if necessary (Bauer).

3.3   Knowledge media: Highlighting a 'conceptual blindness'

While the previous section focused on changes to the material form of pedagogical knowledge media, the following section focuses on key areas of literature about knowledge media in order to make the point that there are a number of significant deficits in the research into their implicit influence—particularly research into the influence of the form of mass-printed knowledge media on beliefs about knowledge.

By far the most prolific area of literature related to mass-printed knowledge media is analysis of their content. Most of the research related to content focuses on two key areas, with the primary one being investigation of how mass-printed knowledge media have influenced racist, sexist and classist discourse (Achugar & Schleppegrell, 2005; Graham, 1998; Horsley, Knight & Huntly, 2010), and the second one being how women and minority groups are portrayed in the fields of history and science (Beck, McKeown, Sinatra & Loxterman, 1991; Loewen, 1995; Nicholls, 2006; Wenzeler, 2003). Knowledge media are always a reflection of the particular bias of the author's worldviews, values and presuppositions (Lemmer, Edwards & Rapule, 2008).

There are a number of reasons why one knowledge medium is preferred over another, but these reasons are often obscure and not necessarily related to content (Callison, 2003; Haight Keenan, 2012; Jobrack, 2011). The selection process varies significantly across institutions and countries. In the United States the choice of textbook is often dictated by the religious leanings of the state and the local school committee (Dale, 2010). According to Callison this politicises the choice of textbooks because they are often used as a religious and political instrument by both conservative and liberal groups. Callison also argues that textbook adoption in some states drives the content of the curriculum more than standards for learning.

Jobrack (2011) describes the relationship between teachers and textbooks as 'dysfunctional'. Jewitt (2005) found that mass-printed knowledge media are often selected for obscure reasons such as their kinaesthetic value—for example, they can play a role in comforting and reassuring students. Bleich (1999) and Callison (2003) argue that mass-printed knowledge media frequently function as a form of insurance for the inexperienced teacher, or play a

'babysitting' role for teachers who are ill prepared, or who do not fully understand the course content.

Jobrack (2011) found that teachers take five main factors into account when selecting knowledge media—rather than choosing them because of their pedagogical, social or epistemological influence, teachers choose them based on price, cover design, the visual layout and effects, the profile of the author and the organisation of the content. Allen (2010) also agreed that price was a key factor in the selection of one knowledge medium over another. According to Jobrack, the ancillaries such as CDs, PowerPoint™ slides, study guides and test banks are not significant in teachers' choices of one medium over another. Similarly, Graves (2001) reported that the incorporation of images and ancillaries by publishers are often viewed as attempts to 'sugar the pill' rather than directly contributing to the pedagogical value of the medium. Likewise Dale (2010) found that many of the features that textbook publishers consider to be key selling points are not considered important by many teachers.

The pressure to incorporate digital knowledge media into pedagogical practice has arisen more as a result of market forces such as price, fashion and presentation style rather than as a result of informed scholarly consensus about how to foster sophisticated (Schommer, 1990, 1993a, 1993b, 2012) ways of knowing about the world. Motivation is provided when those teachers who embrace new technology are rewarded with career advancement (Hennessy, Ruthven & Brindley, 2005); politicians perceive digital knowledge media as a visible indicator that the national educational system is at the 'cutting edge' (Barnes & Strate, 1996); and parents are afraid that if their children are not engaged with digital knowledge media they will be 'left behind' (Druin, 2009). It is noteworthy that governments throughout the Western world have consciously, deeply engaged at a policy level with the incorporation of digital technology into teaching in a way not seen with print (Barnes & Strate).

A number of obscure material influences have contributed to decisions about the content and size of particular knowledge media. For example, the size and weight that students can carry in their backpack and the price that students are prepared to pay are both significant influencers of material form (Callison, 2003). In turn, the material form of mass-printed knowledge media has also influenced the way that schools were physically laid out, and the design of semester timetables (Callison). For example, it was frequent practice to base decisions about the number of chapters that were included in a knowledge medium around the 'semesterisation' of the teaching year. This often had bizarre influences on the content of the course such as the

medium often not running in parallel with the educational programme, or the educational programme being adjusted to comply with the medium.

The way that knowledge media are designed and marketed is rarely based on pedagogically informed practice. Rather than through deliberate pedagogical design, most knowledge media found their way into teaching practice as a result of marketing (Loewen, 1995). According to Loewen, in the field of history most textbook editors started their careers in publishing as sales representatives, not as historians. In other words, their expertise lay in knowledge of the market rather than communication of history. According to Loewen teachers have had little influence on the design of knowledge media, and consequently the material form of the knowledge medium is often unrelated to pedagogical goals.

One of the affordances of mass print is that it was the first medium able to promote itself (Eisenstein, 2002). Print publishers present knowledge media as neutral tools, primarily for the storage and dissemination of knowledge, and make significant claims for their efficacy with little or no evidence to back up these claims. There is in fact a lack of literature that scrutinises such marketing claims.

Rothman (1971) found that most mass-printed knowledge media have been through an extensive process of content 'gatekeeping' before they reach the students, and include only knowledge that has achieved acceptance in the field. He makes the important point that, although mass-printed knowledge media are aimed at students, it is teachers, acting as gatekeepers, who are their primary audience. Although they are written for use by students, the students themselves rarely have an opportunity to choose the knowledge media or influence their content; nor do they have any input into the design. The reasoning behind one knowledge medium being chosen over another is seldom made clear to students (Dale, 2010).

Postman (2000, 2005) sees mass print in its general form as having significant epistemological affordances because, for example, written text allows levels of analytic thinking that simply were not possible in societies that did not have the written word as a medium for storing and sharing knowledge. However he stops short of claiming that mass-printed pedagogical knowledge media, as a subset of mass print, have any particular affordances.

As discussed in Section 2.3, both Ong (1997, 2012) and McLuhan (1962, 1994) claim that mass-printed knowledge media have a profoundly limiting and narrowing influence on

perception. McLuhan and Ong are not alone in their concern about the negative influence of mass-printed knowledge media. While their particular concern is the limitations that the production and distribution cycles of mass print impose on noetic processes, the majority of theorists (although not generally pedagogical theorists) who research the influence of formal pedagogical knowledge media find that they have significant social and pedagogical limitations (Bernstein, 1996; Bourdieu & Passeron, 1990; Callison, 2003; Kuhn, 1962; Levinson, 1997; Wertsch, 1991).

From a critical perspective, far from being an innocent and neutral tool that merely provides a framework for an area of study, mass-printed knowledge media implicitly endorse a deeply ingrained, invisible system for social inclusion or exclusion (Bernstein, 1996; Bourdieu & Passeron, 1990; Callison, 2003; Graham, 1988; Hickman & Porfilio, 2012; Pingel, 2009; Williams, 1983). Bernstein, referring to knowledge media as 'pedagogic devices', is aware of the subtle, but largely implicit, power and control that they exert. Bourdieu and Passeron (1990) are particularly damning in their condemnation of the social influence of mass-printed knowledge media. They argue that such media are a source of elite knowledge that is a form of symbolic capital that serves the interest of powerful groups in society. According to Bourdieu and Passeron, it is those who can successfully utilise the technological resources—such as the pedagogical media—who decide what knowledge is valued by that particular society. They claim that the education system is subtly designed so that the children of the privileged classes succeed, and that this privileging is so embedded in the tools (such as mass-printed knowledge media) that the privileged group appear to succeed quite naturally and appropriately. Graham (1988) went so far as to state that, far from being innocent vehicles, mass-printed knowledge media are instruments for sustaining fear and aggression across generations.

Two large-scale historical research projects (Woodward, Elliott, & Nagel, 1988; Chall, Conard, & Harris-Sharples, 1991) both show that textbooks have had a negative influence on pedagogical outcomes because they constrain the curriculum, innovative teaching approaches and student learning styles. Similarly, White (2008) found that mass-printed knowledge media limit teaching style and creativity, and the teacher's ability to cater for individual student needs. Stambaugh and Trank (2010) found that mass-printed textbooks both represent and mediate a highly stable and institutionalised pedagogy. They researched the extent to which new areas of research that have gained traction in the academic literature are included in new

textbooks. They found significant variation but that the incorporation of new ideas is slow, particularly when those new ideas reflect a significant paradigm shift.

Another key area of analysis has been the extent and ways that knowledge media influence pedagogical practice, particularly in respect of classroom management and assessment, testing and evaluation in formal education (Horsley & Huntly, 2010; Peyser, Gerard & Roegiers, 2003; Wertsch, 1998). Research has considered the role of mass-printed knowledge media to be powerful influencers of student behaviour by controlling the style and degree of social interaction and teacher intervention in the classroom. As tools for achieving social cohesion within the classroom, mass-printed knowledge media provide a unified point of reference for teaching (Bruner, 1996; Callison, 2003, Gergen, 1985; Wertsch, 1998). According to Callison (2003) they position the student as a passive recipient by reinforcing the idea that it is appropriate for all students to be working, largely individually, along a series of pre-established pathways through the content.

Mass-printed knowledge media play a significant role in shaping and endorsing the curriculum by influencing what is legitimately included, and therefore what has been excluded—and even what is perceived as seditious (Kuhn, 1962). Kuhn claimed that mass-printed knowledge media play a significant role in establishing a discipline as a discrete field of study because they expound the body of accepted theory, and the discipline comes to maturity when the textbooks become available in that curriculum field. As such, they also play a significant role in whether students should pass or fail because they define a particular body of knowledge.

According to Chall, Conard and Harris-Sharples (1991), Provenzo, Shaver and Bello (2011) and Woodward, Elliot and Nagel (1988), mass-printed pedagogical knowledge media are instruments of consensus, geared for average conditions and normal children, and written to appeal to a wide audience. Williams (1983) claimed that mass-printed knowledge media have been deeply influential in mediating what he describes as 'school knowledge': knowledge that fits within the instructional paradigm and that is quantifiable.

Kuhn (1962), who was primarily concerned with investigating the method that scientists use to construct knowledge, claimed that textbooks are a deceptively influential medium, and that they play a powerful role in endorsing the "common disciplinary matrix" (or paradigm) of the day. He claimed that it was not the facts and techniques that were highly influential in mediating meaning, but rather that the problems at the end of the chapter were the primary

influencer of meaning because they reinforced the idea that similar ways of thinking could be applied to other problems as an intellectual template or 'exemplars'. He wrote that they are "persuasive and pedagogic; a concept of science drawn from them is no more likely to fit the enterprise that produced them than an image of a national culture drawn from a tourist brochure or a language text" (p. 1).

A review of the literature shows that little critical attention is paid to mass-printed knowledge media from a media perspective. One indication of this deficit is that Education degrees tend to focus on the analysis of content but lack a media focus, and even specialist Media and Communication degrees that critically analyse radio, television and film neglect to analyse print or talk with the same critical focus (Barnes & Strate, 1996). Nicholls (2005), writing about the importance of understanding the philosophical underpinnings of any research into mass-printed knowledge media, lists four different philosophical perspectives: positivism, critical theory, postmodernism, and hermeneutics. It is significant that these different philosophical approaches are all concerned with the analysis of content, rather than the influence of mass-printed pedagogical texts as media.

Horsley and Huntly (2010) found that over 4000 studies are reported annually on the role of technology in teaching and learning in higher education. From a media perspective the significant point about this research is that Horsley and Huntly specifically exclude mass-printed media in their report on the role of technology in teaching: they place them in a separate category called books as though books are not a form of technology. Similarly the International Association for Research on Textbooks and Educational Media (IARTEM) has an annual competition about educational media. In this competition textbooks are placed in a separate category from other media as though they are not actually a type of media (Martin, 2011).

A review of the literature also indicates that there is a dearth of literature that positions mass-printed knowledge media as tools that mediate learning in the same way that digitised technologies mediate learning. Barnes and Strate (1996) and Kress (2003) observed that the influence of the medium of television has been researched to a much greater extent than the influence of text. Forms of mass pedagogical media such as the television or the computer have been extensively analysed from a media perspective (Barnes & Strate; Strate, Freeman, Gutierrez & Lavalle, 2010; Postman, 1998, 2005). Barnes and Strate make the point that the television programme Sesame Street has been the subject of hundreds of studies, but no one

textbook has received the same critical attention. Instead the research has tended to focus on either the use of educational media as instructional technology or on the content of the medium.

Unlike mass-printed knowledge media (as discussed in the previous section), digitised knowledge media are generally perceived as having significant affordances. A number of prominent theorists, such as Papert (1993), Negroponte (1995) and Turkle (1995, 2004), have argued that they have significant pedagogical and social advantages, and that the digitised medium is superior to print in terms of learning and teaching. More recently there has been discussion about the advantages of the 'flipped classroom' (Barber, Donnelly, & Rivzi, 2013), and the learning and teaching advantages of mobile learning environments and 'gamification' (Ibrahim, Vela, Zea, & Sánchez, 2013; Sánchez, Iranzo & Vela, 2013). A number of theorists have examined the learning and teaching affordances of Wikipedia from a media perspective (Leitch, 2014; Yasseri, Sumi, Rung, Kornai & Kertész (2012). Ryan, McCarthy, Byrne and Xiong (2013) found that the increased use of mobile technologies enhances the learning experience by developing higher order thinking and enhancing critical learning. Hersh and Leporini (2013) found that digitised knowledge media significantly improve the learning experience for disabled students. A recent report from the United Kingdom reported that the installation of digitised distribution networks (in this case ultra-fast broadband) improved educational performance by two grades (Williams, 2011).

There are some researchers who claim that digitised knowledge media are negatively influencing knowledge, standards of literacy and social values (Anton, 2012; Carr, 2011; Fallon, 2010; Philips, 1994; Rata, 2013). Woody, Daniel and Baker (2010) have suggested that e-readers are having a negative influence on reading practices, and there are numerous studies pointing to the negative influence of violence on television (Clark, Nabi & Moyer-Gusé, 2007; Gerbner, Gross, Morgan & Signorielli, 1979; King, 2003).

Much of the research into digitised knowledge media takes the form of 'how to' advice on maximising the affordances of digital technology (Hobbs, 2011; Rowlands, 2014; Smith, 2015; Zekan & Peronja, 2012). For example, there is a growing body of research about how to use Wikipedia to improve group interaction and develop consensus skills (Fallis, 2008; Goldspink, 2010). The important point for this literature review is that an equivalent body of research does not exist for mass-printed knowledge media. There is a dearth of literature about 'how to' maximise textbooks as a pedagogical medium.

Likewise, the capacity of knowledge media to influence beliefs about knowledge is not studied by contemporary educational theorists. While Farnham-Diggory (1992) did not research the relationship between pedagogical media and personal epistemological beliefs, she did research how different textbooks aim to achieve different pedagogical outcomes with different sorts of knowledge. She identified five different types of knowledge that can be found, to varying extents, in instructional settings. These types are declarative, procedural, conceptual, analogical and logical. What is of particular note is that, according to Farnham-Diggory, the type of knowledge that is mediated by the textbook is almost never articulated to students. This has parallels with the situation with epistemological beliefs—not only are epistemological beliefs never formally discussed with students, but the capacity for knowledge media to mediate epistemological beliefs is never articulated.

Weiten, Halpern and Bernstein (2012) make the point that there is little research into the ethical influence of knowledge media from a media perspective, and what research there is in this field is confined to the ethics of the publishing industry. Postman (1995) believed that ethics and morality are a crucial consideration in any critique of knowledge media. He pointed out that historically it has been the clergy, politicians or conservative newspaper columnists rather than academics who were more likely to discuss the media's effect on "our moral sense, our capacity for goodness" (p. 65-67). He says that any decisions about why one medium should be chosen over another should be influenced by the extent to which it has the capacity to "enhance or diminish" (p. 65-67) our moral sense and our capacity for goodness. Postman (1995) suggested a number of practical questions that could be asked when trying to assess the influence of media. These included "to what extent do new media give greater access to meaningful information" and "to what extent does a medium contribute to the uses and development of rational thought" (p. 65-67).

There have been widespread calls to incorporate media literacy programmes into the curriculum (Postman, 1998, 2005; Strate, 2014; Street, 1995). Students are neither taught nor expected to critique the knowledge media they are using, and are not encouraged to be discriminating (Harris, 2002). Strate and Postman both stress the importance of increased attention to media awareness for children because they are the most vulnerable audiences (Strate), being less experienced than adults in receiving media messages, less sophisticated in their ability to interpret those messages and less able to engage in critical evaluation of those messages. Over 60 years ago McLuhan (1969) observed:

> For the past 3500 years of the Western world, the effects of media—whether it's speech, writing, printing, photography, radio or television—have been systematically overlooked by social observers. Even in today's revolutionary electronic age, scholars evidence few signs of modifying this traditional stance of ostrich-like disregard. (p. 3)

McLuhan was particularly scathing of the inability to perceive that content is not the most influential form of information, writing, "The content or message of any particular medium has about as much importance as the stencilling on the casing of an atomic bomb" (p. 4).

It is significant to note that this review of the literature concerning textbooks as a medium reveals that the situation has not changed significantly since McLuhan made these comments; while the *ideational* content of mass-printed knowledge media is discernible and extensively researched, the ongoing influence of *form* on epistemological beliefs is neither well researched nor acknowledged by educationalists. What is particularly relevant for this research is that the lack of literature shows that the educational community has not thought about the influence of the material form of knowledge media. Teachers have been slow to recognise the influence of form over content (Culkin, 1968; McLuhan, 1969). Wertsch (1998) described the lack of attention to the mediating power of tools as "conceptual blindness."

3.4   Summary of Chapter 3

Chapter 3 began by explaining the choice of the term 'knowledge media' (or medium) to collectively describe the tools and interactions that are collectively used in the process of storing and sharing pedagogical knowledge. Section 3.2 provided an overview of the dramatic changes of form that are occurring in the material form of knowledge media from an extended historical perspective and in particular the influences of the processes of digitisation. After a prolonged period of relative stability that lasted from the Enlightenment till the mid-1980s, the past 35 years have been a time of intense change in the material composition of knowledge media.

Section 3.3 presented a review of the literature about the influence of pedagogical knowledge media. This review revealed four important points. First, the literature about mass-printed pedagogical knowledge media is primarily concerned with content. Secondly, the literature overwhelmingly positions pedagogical knowledge media as having a negative and distorting influence on knowledge and knowing. Thirdly, the research indicates that teachers have had little input into the design of mass-printed knowledge media, and that these media are selected

for obscure reasons rather than their capacity to support higher level learning such as sophisticated perceptions about knowledge and knowing.

The fourth and highly disturbing point is that the profound influence of print as a medium that mediates perceptions about the value and validity of some knowledge over other knowledge is not a field that is widely researched or even acknowledged by teachers, academic managers or policy makers. The literature also reveals that contemporary teachers are now embracing digitised pedagogical knowledge media with little professional scrutiny from the point of view of epistemological beliefs. What scrutiny there is tends to focus on the content of the digital media or their influence on classroom pedagogy, rather than their capacity for supporting sophisticated perceptions about knowledge. It is disturbing that there is not more pedagogical and scholarly interest in aligning pedagogical practice (and the media that support this practice) with scholarly understandings about the nature of knowledge, or at least ensuring that theory and practice are not working against each other.

In summery this chapter showed that the material form of knowledge is changing rapidly as the processes of digitisation are profoundly influencing the form of the media by which knowledge is stored and shared. As a result, from a media ecology perspective, the modernist assumptions associated with the material form of the era of mass printing are becoming available for reconsideration. The idea that sensory engagement with the material form of the knowledge medium can influence beliefs about knowledge has disturbing social, epistemological and personal implications. If this is the case then, by implication, as the material form of the knowledge medium changes through the processes of digitisation and, as a consequence, the sensory experience of the knowledge medium changes, what is perceived as being valid and valuable knowledge is available for reconsideration. Chapter 4 develops a methodology for investigating this reconsideration.

4 A lens for examining the influence of materiality on beliefs about knowledge

This chapter develops the methodology that addresses the research question: how do knowledge media shape perceptions of knowledge? In particular this chapter develops the methodological justification for approaching the research question from a material perspective. Section 4.1 describes how this methodological approach places specific artefacts, tools or media at the centre of the analysis. It explains the reasoning behind adopting an extended, comparative approach to examining how material form influences epistemological discourse. Section 4.2 discusses the phenomenological basis of the research which, rather than taking a traditional phenomenological approach, analyses sensory engagement with the unique material composition of the knowledge medium. Section 4.3 develops the concept of mediation (Wertsch, 1991, 1998)—defined as the ongoing process of "the mutual shaping of tool and practice" (Vygotsky, 1962, p. 147)—and explains how it is central to this research. Section 4.4 applies the theoretical lens of affordances and constraints (Gibson, 1979) to make the point that close attention to the unique affordances and constraints of the medium provides important information about how the medium refracts epistemological perceptions. Section 4.5 explains how micro-analysing elements of the modal composition of knowledge media can reveal their sensory influence on beliefs about knowledge.

4.1 Placing knowledge media at the centre of the analysis

As stated in Section 2.1 this research is located within the field of media ecology. From this theoretical position the sensory experience of the knowledge medium has greater perceptual influence than the ideational content. This research supports this claim by developing a lens that reveals how the specific media that are used to store and share knowledge form a part of the total sensory environment, and that the micro-analysis of fragments of this environment can reveal important information about the whole. The aim of this close-grained analysis of the micro-interactions and small-scale repeated practices that have arisen as knowledge seekers engage with the material substrate of the selected examples of knowledge media is to understand how these influence individual perceptions about the nature of knowing.

Placing specific artefacts, tools or media at the centre of the analysis and examining how they influence wider discourses is not a new methodological approach. As discussed in Section 1.2, theorists have analysed how the material form—for example, of the window, the printing press

or the railway system—grew to influence wider discourses (Eisenstein, 2013; Innis, 1951; Wachtel, 1978). However, what is different about this research's methodological approach is that, unlike these rather generalised studies, it takes a small seam or fragment of the material world (in this case, of knowledge media) and micro-analyses how the fine-grained material composition of the fragment influences the small "patterned practices" (Poster, 1995, p. 67) that accumulate to form normative epistemological perceptions of that knowledge. Whereas these generalised studies make macro-claims, this research examines how numerous incremental, sensory micro-interactions with specific knowledge media accumulate to form large-scale normative perceptions about the knowledge of the period in which they are produced.

Another way of understanding this transition from micro-influences to macro social discourses is McLuhan's (1994) claim that the communication medium serves as an "extension" (p. 26) of the central nervous system, and the particular extensions of the medium control the speed, scale and specific forms of human association and action. McLuhan's dimensions of speed, scale and specific forms are discussed further in Section 4.6 and applied as a framework in Chapter 5.

The dearth of contemporary research into the ways that the medium of mass print has influenced beliefs about knowledge (as discussed in Section 3.3) indicates the limited attention teachers and educational theorists have paid to this phenomenon. According to Barnes and Strate "…print media constituted an invisible environment that went unchallenged until after the advent of the electronic media in the latter half of the 19th century" (1996, pp. 87-88). McLuhan (1994) also pointed this out when he wrote, "…during his more than two thousand years of literacy, Western man has done little to study or to understand the effects of the phonetic alphabet in creating many of his basic patterns of culture" (p. 82).

The current period in history provides a unique vantage point from which to transcend this conceptual blindness and examine the relationship between the form of the medium and perceptions of knowledge. As was discussed in Section 3.2, after a 500-year period of relative stability in the material form of pedagogical knowledge media, the past 35 years have been a time of intense change in their composition, with the dramatic shift to digitised knowledge media affording a new vantage point. As Vygotsky (1962) noted, when the environment is stable it is difficult to perceive stimuli, and "…it is only in movement that a body shows what it is" (pp. 64-65).

The unique perceptual opportunity provided by a historical perspective is what Kuhn (1962), McLuhan (1969), Ong (1977) and Wertsch (1991) were referring to when they observed that constraints (Gibson, 1979) are typically only recognisable in retrospect. Affordances (Gibson) are visible only until viable alternatives come along that provide a sufficiently wide vantage point from which to perceive the limitations of previous perceptions. (The concept of affordances and constraints is developed further in Section 4.5.) McLuhan (1969) expressed the same point in writing, "We live in the first age when change occurs sufficiently rapidly to make such pattern recognition possible for society at large" (p. 4).

The perceptual ability today to look back, note change, and make comparisons between the old (the mass-printed knowledge media) and the new (the digitised knowledge media) is exposing some of the deep internal structures of the former that had previously gone almost undetected and unquestioned. They are now becoming visible because of the increased ability to step outside perceptual confines and perceive alternatives. Ong (1977) recognised the perceptual clarity of a retrospective vantage point when he stated that the difficulties of understanding the psychological and cultural significance of writing and print were not obvious until mankind had moved into the present age of "telephonic and wireless electronic communication" (p. 18).

At this time of significant change, it is increasingly possible to see and describe the physical changes of form that are emerging in contemporary pedagogical knowledge media. However, the consequent influence that these changes are having on perceptions of epistemological value and validity are more difficult to recognise. Thinking about how digitised forms of knowledge media might influence future beliefs about knowledge is, to some extent, a process of speculation. This chapter provides a framework to bring consciousness to that speculation. In order to do this it develops and applies a methodology for identifying and comparing the material attributes of a chronologically ordered selection of knowledge media to reveal, on a micro level, how their specific material properties subtly influence normative beliefs about perceptions of knowledge.

Although this research is not specifically concerned with analysing the meta-narratives (Lyotard, 1989) associated with knowing and learning—such as the marketisation and democratisation of education—the micro sensory engagements with knowledge media that are the focus of the analysis will inevitably and eventually move beyond individual perceptions about the nature of knowledge to form macro educational discourses. Therefore, while these wider social discourses are not specifically the focus of this research, the broader and longer

term goal is to provide a theoretical lens to enable teachers, academic managers and policy makers to choose and use knowledge media that mediate perceptions that contribute positively to wider considerations about knowledge, such as how to choose knowledge media that mediate a more humane and wiser society. This implicit purpose will be developed further in Section 7.4.

4.2   A phenomenological approach to analysing epistemic thinking

The philosophical position that underpins this research is the idea that perceptions of knowledge—and particularly, in this case, perceptions related to personal beliefs about knowledge— are formed primarily through sensory, rather than cognitive, engagement with the material form of the knowledge medium through which knowledge interactions are transacted. The methodological position that underpins this research is therefore phenomenological, because it is concerned with analysing how beliefs about knowledge are arrived at through almost entirely unconscious sensory engagement between the material composition of a knowledge medium and the senses that stimulate particular patterns of sensory engagement. Whereas traditional phenomenological approaches (Merleau-Ponty, 1962) are concerned with observing or investigating an individual's direct lived experience of a particular phenomenon, this is not the focus of this research. Instead it takes a different phenomenological approach in investigating the sensory experience of the unique material form of the medium, rather than gathering information about a 'real' world. McLuhan (1994) calls this approach "a phenomenology of the senses".

Underpinning this methodological approach is the point that, from a media ecology perspective, every medium of knowledge, including dialogic communication using spoken word and gestures, has unique elements of materiality—and interactions with knowledge media are always a sensory response to this unique materiality. The unique composition of this materiality implicitly influences the nature of the social interaction that is at the heart of knowing. In other words, the medium that facilitates the social interaction that social constructivists and constructionists perceive as being at the heart of meaning-making is not only a vehicle for carrying the content for the social transaction but is also a powerful influencer of the sense-making process. Therefore the sensory experience of the social interaction is always contingent on the material form of the transactions of the knowledge engagement, and the form by which thoughts and ideas are transacted influences perceptions of these transactions to a far greater extent than the ideational content of the transactions. For

example, the material properties of the knowledge medium (such as the rapidity of the feedback loops and the extent to which participants can sense the presence of each other) unconsciously limit or enhance the degree of intimacy that participants can achieve, and this profoundly influences the sensory nature of the knowing that is mediated by these transactions.

From a phenomenological perspective the presence or absence of the other or others who are mutually engaged in knowledge transactions is a highly significant element in the experience of knowledge. According to Craig and Muller (2007), the extent to which technologies inhibit or enhance the experience of 'otherness' is always at the heart of phenomenological theorising. A number of seminal theorists (Buber, 1987, 2002; Goffman, 1959) across a range of philosophical approaches acknowledge that sensory engagement with others is phenomenologically deeply significant. The sensory experience of others or 'otherness' is at the heart of Ong's theorising about oral ways of knowing (Ong, 1977, 2012), and Finnegan (2002) considers that the experience of 'otherness' is central to the human experience of emotions such as empathy, anger, moral responsibility, caring and jealousy.

The experience of others in oral ways of knowing is phenomenologically different from the experience of the others in literate ways of knowing (Ong, 1977, 2004, 2012). The difference lies in the way that the production, distribution and consumption processes of mass-printed knowledge media create a physical and emotional distance between the writer and the reader. However, it is important to point out that this is a matter of degree, and that the written word has always, to some extent, been an instrument of communication——albeit one-sided communication—where the author of the book takes "an extended turn" (Mead as cited in Gergen, 1985).

It is difficult to recognise otherness in knowledge media that have been mediated by the technology of mass-printed text because the social, dialogic aspect of knowledge has been flattened out, made less visible and intellectually devalued. From an epistemological perspective this perceptual difficulty is highly intellectually disconcerting given that (as discussed in Section 2.5) the best contemporary, philosophical theories about coming to know overwhelmingly concur that coming to know about the world is actually a social process of transactional, relational sense-making rather than a process of analysing "visual analogues" (Ong, 2012, p. 89) on a page.

Analysing the sound (or voice) of others, even as mediated by text, is a way of detecting and theorising the extent to which others are present or absent in the knowledge medium. In terms of this research, this provides important information about the degree to which the knowing is a social process of transactional, dialogical sense-making as opposed to interpreting representational analogues. The analysis in Chapter 5 situates the three examples of knowledge media that have been selected for analysis in the social world by analysing the extent to which other or others are present in the knowledge transactions through examination of how the flow of discourse is enhanced or inhibited by the material composition of the medium. From this perspective, an emerging set of transactional behaviours (or breaches of the social etiquette surrounding these behaviours) such as listening, face-saving, turn-taking, responding and empathising all become data for analysis in knowledge media that are situated in social interaction. These subtle interactional cues are visible and permanently recorded for analysis in the Wikipedia medium.

4.3   Mediation: the mutual shaping of tool and practice

Underpinning this research's methodological framework is the premise that examining the point of interaction between the senses and the material composition of the medium can reveal important information about how the world (in this case the world of knowledge) is perceived. Wertsch (1998) called this perceptual vantage point "living in the middle" (p. 65). He theorised that insight into how the world is perceived is achieved not by granting analytic primacy to either the social world or the psychological world, but by analysing the two-way flow of meaning between the agent and the tools (intellectual and material) that the agent is engaging with. Examining knowledge media (included within this term are people as a form of knowledge medium) from this perspective makes it clear that, more than just disseminating content, they are powerful influencers of epistemological perception.

In unpicking this two-way flow of meaning, this analysis provides a lens to examine how sensory engagement with the material substrate of the medium influences perceptions about what it means to know about the world. This two-way flow is a complex interaction—a "mutual shaping of tool and practice" (Vygotsky, 1962, p. 76) that is the process of mediation (Wertsch, 1991, 1998; Vygotsky, 1962). From the perspective of mediation, the knowledge media that are being analysed in this study are prisms and the discourse (words and actions) that flows through these prisms is refracted on specific trajectories by the unique material properties of the medium.

A way of understanding this analytical perspective as it relates specifically to analysing composition rather than content is to imagine that time-travellers from a distant future enter an abandoned, entombed classroom from the late 20th century and early 21st centuries. Inside the classroom they find a well-thumbed (it must be well-thumbed because it is only through repeated, sustained engagement that a medium has the power to influence personal epistemological beliefs) classroom textbook on a desk. What the visitors note is not the content, but consistently justified lines and carefully composed pages that give the sensory impression of some definitive, authorised form of knowing; the division of pages into sequentially ordered chapters, headings and sub-headings suggesting a topic that can be hierarchically systemised, confined and mastered; the bound and uniform pages that mediate the idea that it is possible to come to know entirely within the boundaries of the single text through deep individual intellectual engagement; and the clear separation of the contents of the text from the external context leading to the idea that rational neutrality is a superior way of knowing compared with emotional engagement or intuition. It is the 'strangeness' of the medium that allows the time-travellers to make this dispassionate assessment of the composition of the medium.

In order to investigate the sensory influence of the three knowledge media that are the subject of this research, it was necessary to find a way of analysing the sensory influence of material composition, such as the weight of the medium, the evanescence of the medium (the extent to which the medium can be remediated into other formats—for example, reconstituted on an i-Phone or i-Pad), and the degree to which the knowledge medium facilitates reciprocity and mutual influence between those who are mutually engaged in the knowledge conversation. These aspects of material composition all contribute to influencing perceptions about knowledge, particularly the extent to which knowing is situated in the social world.

Building on the work of Vygotsky (1962), Wertsch (1998) developed a highly specific framework or dialectic for theorising and revealing the mediating influences of cultural tools. The heart of Wertsch's argument is that human action is fundamentally shaped by cultural tools; all cultural tools, even language, have some degree of materiality; and the unique properties of this materiality shape the specific flow of communication and influence the particular epistemological bias mediated by that particular cultural tool.

While the term knowledge medium does not correspond perfectly with the term cultural tool, the important point that makes Wertsch's dialectic useful for this research is that he taps deeply

into the ways that the unique material qualities of the medium influence cognitive engagement. From Wertsch's perspective, subtle differences in engagement with the knowledge medium such as whether knowledge is written in ink pen or lead pencil, or whether a text is viewed on paper or on an iPhone matter greatly.

Wertsch (1997) developed a ten-point heuristic for examining how unconscious dialectical engagement with a particular tool or medium arcs or bends cognitive engagement. He claimed that there is always an irreducible tension between agent and mediational means, that mediational means are always material, that mediated action typically has multiple simultaneous goals, that mediated action is situated on one or more developmental path, that mediational means constrain as well as enable action, that new mediational means transform mediated action, that the relationship of agents toward mediational means can be characterised in terms of mastery, that the relationship of agents toward mediational means can be characterised in terms of appropriation, that mediational means are often produced for reasons other than to facilitate mediated action, and that mediational means are always associated with power and authority.

The subtle, two-way, irreducible flow of meaning (Vygotsky, 1962) between the cultural tool (in this case those associated with the formal process of coming to know) and the cognitive or sensory (from a media ecology perspective) experience of these media is the process of mediation (Wertsch, 1991, 1998; Vygotsky). Wertsch (1998) identified two kinds of mediation: implicit and explicit. (He also claimed that Vygotsky (1962) similarly recognised two distinct types of mediation involved in human cognition but that Vygotsky did not explicitly articulate the difference.) This research is concerned with implicit mediation because it is an analysis of how perceptions of value and validity are *unconsciously* mediated by the sensory experience of the material composition of specific knowledge media used in daily pedagogical practice and how these media, in turn, shape perceptions.

While each element of Wertsch's (1998) ten-point dialectic provides important insight into the implicit influence of mediation on meaning, this research is particularly focused on the influence that the unique material composition of the knowledge medium has on sensory perception. Therefore what is noteworthy about Wertsch's heuristic for this research is that a number of the elements of the heuristic specifically explore the deep perceptual interconnection between the unique material nature of the knowledge medium and epistemological perception.

One of Wertsch's (1998) claims about the influence of the unique material nature of the medium is that action is always situated on one or more development paths. In other words, how a technology (or knowledge medium) is used is not necessarily the only way it can be used. This is what Wertsch meant when he wrote that mediated actions always involve multiple goals that play out simultaneously across a complex range of contexts—cultural, historical and institutional. In other words, the sets of meanings produced by the medium always operate independently to the intentions of the medium: the users of the tool think they are doing one thing but another is occurring. An example of this that is central to this discussion is that when Peter Ramus introduced mass-printed textbooks he had no idea that over 500 years later they would continue to influence pedagogical practice—there is a widely recognised correlation between the adoption of standardised, mass-produced knowledge media and the development of centralised curricula.

Wertsch (1998) argued that mediational means constrain as well as enable action. An example of this is that mass-printing of knowledge involved breaking content down into small sequential, carefully graduated steps. This can be seen as an affordance in terms of individual mastery of specific content and credentialisation. On the other hand this has facilitated rote learning and textbooks being used as a crutch for teachers who are unfamiliar with the subject matter.

Wertsch (1998) also claimed that new mediational means always transform action. A frequently acknowledged example of this is that the development of the lens, and the subsequent development of the telescope, mediated psychological distance between human perception and the material world. This contributed to the development of detached objective scientific discourse.

The key point about Wertsch's (1998) heuristic is that the material composition of the knowledge medium provides an important point of analysis, and that isolating, reducing and analysing elements of the material composition of the medium by which knowledge is mediated can reveal important insights into questions about how knowledge seekers come to develop immature or sophisticated beliefs about knowing, and how the medium of knowledge engagement powerfully influences human values. At the heart of this analysis is the idea that the media by which knowledge is mediated are not neutral conveyors of meaning; they have the potential to twist meaning in subtle ways that are difficult to detect. The challenge is to be

mindful of the influence of composition, and carefully select which knowledge media are used and how they are used.

Although Ong (2012), as a result of his ongoing research into the influence that text has on consciousness, became aware of the deep, complex, mutually influential relationship between tool and practice, he did not use the term mediation in his analysis. However, when he placed the pedagogical knowledge media that had been designed by Peter Ramus (Ong, 2004) (as discussed in Section 1.4) at the centre of his analysis, he implicitly acknowledged the mediating power of tools and recognised that perceptions and sensory interactions with the tool (in this case knowledge media) are always deeply interrelated. Therefore the process of mediation—the implicit connection between the material affordances and constraints of the medium, and the practice of using the medium—was implicitly central to his 1954 research into the widespread influence of the knowledge media produced by Peter Ramus.

4.4   Exploring 'soft' determinism

One way of being mindful of the subtle, unconscious influence of materiality is by examining material composition (in this case, of knowledge media) through the lens of affordances and constraints. This is a term that Gibson (1979) used to describe how the material characteristics of a device or interface influences the way it is used, thereby privileging some meanings over others and choreographing a perceptual bias. The perspective of affordances and constraints has been widely applied to new media (Strate, 2014; Barnes & Strate, 1996; Ling, 2008), however, as shown by the review of research in Section 3.3, educationalists have tended not to recognise the significance of mass print as a medium that influences perception—particularly, in this case, perception of beliefs about knowledge.

An examination of the affordances and constraints of the media of talk and text is at the heart of a media ecology approach to theorising about knowledge. Ong (1977, 2012) attributed to the spoken word a number of unique communicative affordances. In fact, he claimed that the spoken word is the least visible and yet most powerful knowledge medium of all the media of communication (1977, 1986, 2012). As discussed in Section 2.2, Ong perceived societies whose primary knowledge engagement had been by means of the spoken word in a positive light. He said that these "primary oral societies" (Ong, 2012, p. 46) have a more holistic view of the world and a tendency to be highly attentive to their immediate external environment, and are comfortable with expressing emotions in much more open and honest engagement with

others. Ong is not alone is attributing the spoken word with highly epistemologically influential communicative affordances. A number of theorists (Buber, 1987; Furniss, 2004; Goody, 1977; McLuhan, 1994) also perceive the affordances of the spoken word as a primary medium for coming to know.

Ong (1977, 2004, 2012) devoted most of his academic life to studying the determining constraints of mass-printed knowledge media. In his view, modern sensibility has been dulled by two hundred years of engagement with the printed word, which has blunted the senses and flattened out experience. Postman (2005) perceived both the affordances and constraints of the mass-printed knowledge medium. He wrote that although the printing press had significant intellectual and social benefits it also had "monumental" (p. 31) costs. While, on the one hand, print gave prose to Western world, on the other it made poetry into "an exotic and elitist form of communication" (p. 29). He attributed the printing press with giving inductive science to the world, but in doing so it "reduced religious sensibility to a form of fanciful superstition" (p. 31). McLuhan (1969) was also aware of the constraints of print when he said that the alphabet served to "neutralise all the rich divergences [sic] of tribal cultures by translating their complexities into simple visual forms which allowed intellectual and emotional detachment from the immediate surroundings" (p. 8).

The idea that the material composition of the medium of communication privileges certain ways of knowing over others is at the heart of a media ecology way of thinking. This privileging is what Postman (2005) was referring to when he wrote that it simply was not possible to do philosophy with smoke signals—a metaphor that indicates that different media have different affordances. For example, language—in both oral and written forms—enables comparison of one thing against another, discussion about what something is 'not', and talk (and therefore theorising) about the past and the future (Hargie & Dickson, 2004; Postman, 2005). Burgoon et al. (2002) claimed that an affordance of oral communication is that it is much more authentic and spontaneous because most of the communicating work is done moment-to-moment rather than in a pre-planned way. In contrast, image, as a medium of communication, cannot express the past and the future, but it can mediate a high level of emotion (Langer, 1953).

On the other hand, print has a number of powerful affordances that the spoken word does not. Writing is the only medium that can convey complex, analytical structures (McLuhan, 1994; Ong, 2012; Postman, 2005). The written word provides the reader with the opportunity to re-

read, recall, reconsider, go forward and back in the text, compare, and reflect on an idea outside the emotional demands of the immediate context. One significant epistemological affordance of mass print is that it allows standardised and exact replicas to be disseminated over vast distances, slowly but with complete fidelity (Postman, Strate, 2012a).

While Ong (2012) did acknowledge that text (including mass-printed text) had several affordances he was quick to point out its constraints. He went so far as to say that print was a dangerous medium of communication because the "visual fixity" (p. 81) produced by mass printed texts subtly validated certain styles of knowing over others. For example, print encouraged a sense of extreme certainty about the way the world is, and cultivated the belief that it was possible to order the world into manageable, intellectual segments. Ong (1986) perceived that print had taken "possession of consciousness" (p. 23) and effectively blocked understanding "of what writing itself really is" (p. 23). In the same vein, Eisenstein (2013) warned that, while print had enormous social and intellectual affordances, it also inhibited knowing in a number of ways. She wrote that although print provided the ability to stand back and reflect in a detached, intellectual way, it also validated the idea that the most legitimate form of knowing was emotionally detached examination of the underpinning logic and inconsistencies in the argument.

Postman (1995, 2000) researched the determining power of media from a moral and ethical perspective. Rather than assume a neutral observer's position on the biases of various media, he warned that it is important that we 'keep our symbolic house in order' (2000). Awareness of the influential power of the particular medium of communication is essential, and casual adoption of new media without consideration of their deeper epistemological influences could have far reaching and unexpected consequences.

McLuhan (1994) claimed that he avoided value judgments about the superiority of one medium over another. He (1969) stated that he neither approved nor disapproved; instead he sought to achieve rational detachment from the determining power of knowledge media, particularly television and film. What motivated him was his desire that his audience become as aware of new media environments as they are of stepping into a bath. He wrote that "…all I have to offer is an enterprise of investigation into a world that's quite unusual and quite unlike any previous world for which no models of perception will serve" (p. 249). He regarded media as powerful and pervasive (McLuhan & Cooper, 1967), having the capacity to "work us over

completely" (p. 26). He warned that unless we were mindful of this we would end up serving our media rather than them serving us, and that media are only deterministic if we ignore them.

The key point in any discussion of technological determinism is that the privileging of some meanings over others is always a double-edged sword: a 'trade off' (Levinson, 1997; Wertsch, 1991); a series of 'gains and losses' (Kress, 2005); a series of possibilities and drawbacks (Gibson, 1979) and 'extensions and amputations' of human reach (McLuhan, 1994). Postman (1995) suggested that in order to avoid entering into a "Faustian bargain" (p. 192) with computer technology, educators should ask themselves the following three questions: what problem are they going to solve; whose problem is it; and will they solve the problem without creating other problems that we can anticipate?

The theorising of media ecologists (McLuhan, 1996; Ong, 1977a, 2004, 2012; Postman, 2005) has been criticised on the basis that their position is technologically deterministic. McLuhan is particularly criticised from this perspective (Williams, 1983). Barnes and Strate (1996) described a media ecology approach as a sort of "soft determinism" (p. 183) because it considered how the media environment influences epistemology through a complex web of subtle interrelationships among society, culture and individuals. However, McLuhan, Ong and Postman all claimed that, far from being deterministic, recognising and reflecting on the unconscious biases of knowledge media in order to develop conscious awareness of their power to shape epistemology is emancipatory. From this perspective, while it is impossible to avoid the mediating influence of the affordances and constraints implicit in the materiality of knowledge media, it is possible to reflect on their determining power and become aware of their perceptual bias, and in doing so avoid becoming victim to them (McLuhan, 1969).

Therefore, rather than accepting that technologies are deterministic, this research is motivated by the idea that analysing the changing material composition of mass-printed text (as a medium) can reveal unconscious, and possibly limiting, beliefs about knowledge.

4.5   Modal composition: the sensory data for analysis

From a methodological perspective the idea that the unique material composition of a medium has a subtle but powerful influence on meaning-making is relatively new. Until recently theorists have tended to focus their attention on language, with a number of seminal theorists (Gee, 1999; Halliday, 1978) developing methodologies to examine how language-based

discourse unconsciously influences perception. From this traditional discourse analysis perspective, language superimposes a web of meaning on the world that actively shapes it and becomes, in some way, true (Gergen, 1985). Examined from this perspective, books and web sites (as examples of knowledge media) are merely the vessels that carry the ideational content, and their unique modal composition—such as font, weight, length, type of page ordering, amount of white space and use of hyperlinks—does not significantly impact on their meaning-making capacity, and is therefore not relevant for analysis.

This research adopts a different perspective on discourse analysis, and is concerned with the ideational content of knowledge media *only* as it is influenced by the material composition of the medium. For example, the pedagogical knowledge media being analysed in this project are all loosely associated with coming to know about the field of sociology, but it is not within the scope of this research to examine questions about the nature of sociology as a curriculum subject, the current sociological debates about the gap between rich and poor, or the social impact of the ageing populations. Instead the research interest lies in examining how the increased visibility of the author or authors in the knowledge medium is changing perceptions about whether mastery of measurable facts is an indication of understanding about the field of sociology, or whether expanding the range of legitimised participants in the process of coming to know is leading to broadening perspectives about sociology that include empathy or tolerance towards others' points of view.

The idea that the medium carries sensory meaning has long been recognised in spoken communication where it is readily acknowledged that communication is made up of an extensive array of nonverbal cues such as paralanguage, gesture and haptics that all contribute to the overall meaning (Hall, 1959). But the sensory nature of engagement with texts has only recently been theorised (Jewitt, 2004, Kress, 2003; Kress & Van Leeuwen, 2001). These theorists have developed a multimodal approach to analysing both the representational and interpretative choices that communicators make when engaged in meaning-making. A multimodal approach highlights the fact that when engaging with a handwritten document (for example) there is an unconscious perceptual response to the sensory experience of the substrate of the medium such as the style of the handwriting, the crossings-out, the competence (or incompetence) of the grammar and spelling, the weight of the stock, the promptness of the response from the receiver, and the smell of the paper.

Multimodal theorists (Kress, 2003; Kress & Van Leeuwen, 2001) were originally primarily concerned with examining the semiotic influence of the changing modal configuration of text and images on pages and screens—in other words, they were primarily concerned with analysing meaning-making within the environment of representational knowledge. There is now widespread recognition that these early semiotic approaches are no longer adequate. It is becoming increasingly clear that, despite the appearance of similarity the page and the screen are different forms of media, and therefore the methodologies that were appropriate for analysing two-dimensional conceptions of knowing are not necessarily adequate when knowing is increasingly mediated by screens.

A number of more recent multimodal theorists (Norris, 2004; Norris & Jones, 2005; Jewitt, 2007; Scollon & Wong Scollon, 2004) have developed methodologies for analysing face to face and screen-based forms of interpersonal communication from the perspectives of the modes of gaze, gesture, posture and movement. These new approaches examine semiotic engagement with media "in the round" (O'Halloran & Smith, 1999, p.1). While these approaches are increasingly sensitive to interpersonal interaction they still perceive it from an emotionally detached, representational point of view. In other words, even these more recent multimodal perspectives, which include analysis of human forms of expression, do not detect the transactional nature of human communication or the sensory presence of emotions such as empathy, anger and suspicion.

In order to detect the sensory experience of knowledge, the analysis in Sections 5.3 – 5.5 focuses on the particular compositional modes that enhance or constrain the sensory experience of time, space or engagement with others. Examples of these specific modes include: the presence or absence of dates; specific topical references to current events; the extent to which the disputes and reworkings involved in generating the medium are visible and current; the consistency of font size and type; the perceptual influence of the thickness of the stock (where the medium is in print form); the extent to which the images are embedded in the text or an adjunct to the meaning; and the extent to which hyperlinks facilitate dialogue between those participating in the knowledge medium. This approach is based on the claim that close modal analysis of a small number of examples can reveal important information about the communicative affordances and constraints of the wider medium (Bezemer & Kress, 2008; Jewitt, 2005a, 2005b, 2006, 2007, 2008; Jewitt & Kress, 2003; Bezemer & Kress, 2008; Kress, 2001; Kress & Van Leeuwen, 2001; O'Halloran & Smith, 1999).

Theorising and analysing the shift from representational forms of knowledge to forms of knowing where the sensory experience of others is a detectable, valid part of the knowledge 'sensorium' is methodologically challenging. Bruner (1990) noted that there is a lack of research that attempts this methodological task when he wrote that most research into how human beings come to know is drawn from studies of knowing about the physical rather than the human or symbolic world. He stated that we know "altogether too little about how we go about constructing and representing the rich and messy domain of human interaction" (p. 4).

An important element of the multimodal analysis in this research is that it examines the modal significance of both things and people—it uses multimodality as a way to treat materially diverse knowledge media such as mass-printed books, digitised software and people on the same sensory level. By breaking down the experience of knowledge into its individual modes such as font size, page layout and the weight of the paper, material modes can be placed alongside the more evanescent mode of others who are mutually engaged in the knowledge experience. This is a particularly important element of this research because it examines how epistemological beliefs are changing now that the materiality of knowledge media is composed increasingly of co-presence between humans rather than between humans and texts. It recognises that one way of detecting individual engagement (rather than visual representations) is by observing the extent to which the behaviour of the participants in the knowledge transaction is, in some way, modified (or not) in response to the others also engaged in coming to know. This sense of co-presence can be perceived as the extent to which those engaged in coming to know are responding to each other's intentions, feelings and reactions (Burgoon et al., 2002; Goffman, 1959; Walther, 2005).

A key point of difference between this research approach and traditional applications of multimodality is that the former applies analysis of specific modes as a way of observing and analysing not only what modes are *present* in the medium but also what modes are *absent*, and recognises that the absence of specific modes contributes significantly to the sensory experience. This examination of the affordances and constraints of the medium addresses the question of not only what the materiality of the medium enables in terms of sensory experience, but also what it limits in terms of sensory experience.

4.6 Summary of Chapter 4

This chapter has broadly developed the methodological approach that underpins this research. It explained the phenomenological basis of the research by developing the case for the intertwined relationship between material form and sensory experience, and how this relationship mediates (Wertsch, 1991, 1998) variations in epistemological beliefs. In particular it established the phenomenological significance of the presence of 'the other'—the other person or people who are implicitly engaged in the process of sharing and storing knowledge, and whose voice is increasingly being heard in the knowledge experience. It explained how the concept of affordances and constraints (Gibson, 1979) provides a way of thinking about not only what the unique modal composition of the medium enables in terms of sensory experience but what it limits in terms of sensory experience. It established the case for separating and micro-analysing the individual compositional modes of knowledge media as a way of revealing the normative epistemological beliefs that these knowledge media mediate. It also discussed how compositional modes that are *not* present in the experience of knowledge are an important, but difficult to identify, element of the sensory experience.

Up until this point in the research the materiality of knowledge media has been discussed in a general way. In the following chapter the methodological framework is developed more specifically and applied to three specific, chronologically ordered examples of knowledge media in order to differentiate and compare their unique modal composition along three sensory dimensions, and to analyse how this changing modal composition is influencing epistemological beliefs.

5   A microanalysis of three comparators

The previous chapter established a broad methodological approach for analysing how the sensory experience of the material composition of the knowledge medium mediates particular perceptions about the value and validity of some ways of knowing over others. From this point the research takes a narrow (or micro) view of knowledge and knowing. It refines this broad methodological approach to develop a specific framework or lens in order to examine specific, incremental sensory shifts as the processes of digitisation influence the material composition of three specific examples of knowledge media.

Section 5.1 outlines the lens. It describes how the lens makes the three specific examples of knowledge media 'strange' so that their influence can be more easily perceived. As part of this strange making process these three examples are compared diachronically focusing on the sensory experience (or absence of sensory experience) as mediated by the specific material elements or modes that have been selected for analysis.

Section 5.2 introduces the specific comparators that have been chosen for analysis in this research, and explains why these particular examples were chosen. The three media are: a 1960s classroom textbook—Vernon, A. (1965). *Human interaction: An introduction to sociology*. New York, NY: The Ronald Press Company; a classroom textbook from 2010—Carl, J. (2010). *Think sociology*. Upper Saddle River, NJ: Prentice Hall; and the Wikibook—*Introduction to Sociology* (http://en.wikibooks.org/wiki/Introduction_to_Sociology).

In Sections 5.3 – 5.5 these three examples are compared diachronically along the sensory axes of time, space and the extent to which the voice of the 'others' who are mutually engaged in the knowledge transaction can be heard (McLuhan, 1994).

Section 5.6 examines the extent to which the analysis supports Schommer's findings that those with sophisticated epistemological beliefs find authority in rational detachment rather than through trust in the certainty of texts. Section 5.7 theorises about the nature of the epistemological beliefs that are emerging in the increasingly digitised knowledge environment. It considers this through the lens of Ong's theories about an emerging 'secondary orality' (2012). Section 5.8 summarises the findings in Chapter 5.

5.1.1 Strategies for strange making

The motivation behind this research was my suspicion that my textbook from 1965 was not as neutral or innocent as it seemed. Although it was published in 1965 I sensed that the material composition of the Vernon knowledge medium (*Human Interaction: An Introduction to Sociology*) continues to be highly perceptually influential— similar examples of pedagogical knowledge media can be found on most recommended reading lists associated with formal teaching programmes today.

My curiosity about the unconscious influence of this medium, and others like it, was aroused. I wanted to know more about how it had influenced my perceptions of knowledge and knowing. In order to achieve this I sought a way to view this apparently mundane knowledge medium with fresh eyes—in ways that both refreshed and disturbed my perception. I sought to apply a process of 'strange-making' Tracy (2012) as a way of unsettling the habitual perceptions and conceptions that had lulled me into accepting that this knowledge medium was merely a neutral carrier of content.

It took me several years to develop an intellectual strategy make the knowledge medium 'strange'—it lay on a shelf in my office while I thought about how to go about investigating its influence.

In the process of reflecting on the research question, I became aware that a number of changes, or breaches, in knowledge norms were occurring around me (Mules, 2013). For example, in 2012 I attended a prestigious conference where one of the keynote speakers began his PowerPoint ™ presentation with a photograph of his recently-born daughter. This explicit inclusion of personal information was unusual in a formal academic setting, yet it seemed to be tacitly accepted by the audience as a valid contribution to the establishment of his credentials.

Another example was a friend's recounting of her childhood experience of being molested by the school caretaker. From an epistemological perspective the significant point was that her claims, which were based entirely on her own perceptions of what occurred, were unassailable—in the past the opinions of the experts or authority figures would have been given greater precedence. I was aware that changes like these were occurring more and more frequently. However, while I was able to observe and consider them as unique incidents, placing them within an analytical framework was challenging.

I was familiar with the writing of Vygotsky (1962) and Wertsch (1991, 1998) and their close analysis of the mediating power of tools, but (as discussed in Section 4.4) both considered knowledge and knowing a cognitive process. It was not until I became familiar with the theorising of media ecologists, and in particular the writing of Walter Ong, that I was able to begin to think about a methodological approach for framing the research. As discussed in sections 2.1, 2.2 and 2.3 Ong has contributed to the methodological framework of this research in two significant ways. First, Ong theorised knowing and knowledge as an unconscious sensory experience rather than an intellectual process. Secondly, through his analysis of the study of the noetic influence of early forms of textbooks Ong provided a way of considering alternative ways of knowing outside the confines of the framework of knowledge associated with mass print, and therefore he provided a lens through which I could question many of my own knowledge assumptions.

After reading Ong's ideas about the nature of knowing in primary oral societies I conducted an experiment to examine the extent to which my knowledge assumptions were mediated by the medium of mass-printed text. In this experiment I attempted to investigate the research that is the focus of this thesis orally, without any form of written support. I discussed the project with several of my peers and decided that, as the experiment prohibited me from using any form of recorded text, one valid approach would be to verbally record my progress at the end of every day. Crucially I would not be permitted to view these daily recordings until the project was complete.

The results of this small experiment were disturbing. I continued it for four or five days before giving up in frustration. I found that I was almost completely unable to hold the research question in my mind for any sustained period of time, let alone begin to progress the research question. The only tools available to me for investigating the research question were discussions with others and personal reflection. Without the use of the written word to record key points from discussion and the personal reflection, both of these research tools proved impractical. In terms of discussing the research question with others, each person with whom I discussed the question came up with new approaches, opinions and perspectives, but I was so intent on holding on to the information I already had that I was unable and unwilling to fully and deeply consider alternative views. In terms of deep reflection as a technique for coming to know, without the support of writing, it proved impossible to develop and hold a sustained line of thought. I was simply unable to think on the abstract level necessary for this intellectual

exercise. It rapidly became clear that I had poorly developed memory skills, and within a few days I abandoned the experiment. This experiment led me to realise that the differences between the oral ways of knowing (unsupported by text) and literate ways of knowing are profound.

Eventually my research question emerged: how do knowledge media shape perceptions of knowledge? This question has two dimensions. The first element of this question is what are some of the specific epistemological influences that the medium by which knowledge is stored and shared has on perceptions of knowledge, and how are these changing as the material composition of these media become increasingly digitised? The second element is what are the sensory processes by which knowledge media influence perceptions of knowledge?

It is important to stress that this research is interpretive and makes no claims to be an empirical study or to provide hard measures for comparing specific changes in personal epistemological beliefs. Rather than a 'real world' uncovering of data this research aims to provide an analytical framework for making the unconscious changes that are occurring in beliefs about knowledge examinable. Therefore the usual conditions related to empirical enquiry such as methodological issues around choosing a representative data set, and data validity and reliability, do not apply in this research. The particular knowledge media chosen for this analysis have been selected because elements of their materiality are perceptually comparable on a timeline. The specific comparators chosen, and the rationale for these particular choices are discussed in Section 5.2.

Another aspect of the research that needs to be reiterated is that the content of the examples of the knowledge media being analysed is not the focus of this research, except as it is influenced by the material composition of these media: for example, the idea that sociology, as a field of study, can be perceived as a consequence of the material form of the medium of print. In other words, this research is not concerned with macro discussions about social concepts such as racial and ethnic interaction, the role of the family in society, or the impact of social stratification. Nor is it interested in the accuracy of the content or the extent to which the content is 'dumbed down' (for example) except where these elements of the medium are a response to material processes. Instead this research is concerned with analysing the seam of meaning that runs below the content and that is mediated by sensory interaction with the material elements of the medium: in other words, this research is concerned with examining knowledge media from a media perspective.

5.1.2   Analysing the sensory influence of the medium

From a media ecology perspective repeated 'micro' acts of sensory engagement accumulate to form broader macro, normative cultural assumptions about knowledge and knowing. In order to investigate the influence of material composition on perceptions about knowledge I needed a way of organising these micro acts of sensory experience. I chose to base the sensory experience of the knowledge media chosen for analysis on McLuhan's sensory extensions of speed, scale and specific human form (1994). It is important to stress that the division of sensory experience into three different sensory extensions is, to some extent, arbitrary. Sensory experience is complex and these sensory extensions overlap. For example time and sound are deeply perceptually interwoven because sound is a dynamic phenomenon that only exists as it is going out of existence (McLuhan, 1994; Strate, 2011).

McLuhan (1994) theorised that every medium works as an extension of human sensory experience, and every medium works by exaggerating or limiting the particular sensory experience thereby mediating new forms of awareness. From this perspective the 'message' of any medium or technology is the change of scale, pace or pattern that it introduces into human affairs (McLuhan, 1994) and how it ..."shapes and controls the scale and form of human association and actions" (p. 9) when the medium is routinely engaged with. These subtle alterations in sensory amplification or acceleration have unconscious psychic influences, and these psychic influences are the real meaning or message that is mediated by a medium regardless of the ideational content that medium carries. The following analysis breaks down and examines these subtle alterations.

The analysis applies McLuhan's three sensory extensions of time, space and sound (or "specific human forms" (McLuhan, 1994, p. 43)) as the organising framework for Sections 5.3 - 5.5. The analysis is divided into three strands: the extent to which the examples of knowledge media being analysed are temporally sensitive; the extent to which they spatially constrain knowledge by controlling the flow of interaction and confining knowledge engagement with the printed page; and the extent to which they mediate or limit sensory perception of the presence of the other or others who are mutually participating in the knowledge transaction.

This third axis of "specific human forms" (McLuhan, 1994, p. 43) is theorised in this research as the degree of otherness mediated by the knowledge medium. Strate (2012a) describes this sense of otherness as the extent to which the sender, receiver, author or reader is present for

each other as the "conditions of attendance" (p. 448). This sense of the presence of the other is examined on a continuum of distance versus presence and is measured by the extent to which the authentic other can be 'heard' or experienced in the medium.

Detecting the extent to which the knowledge medium mediates or facilitates sensory engagement with others is a key element of this research. According to Ong (1977a), one test of presence is the level of "spontaneity or openness" (p. 299) between those who are engaged in the knowledge transaction. As discussed in Section 2.5, the extent to which emotional engagement with others is mediated by the medium of knowledge is central to the development of personal epistemological beliefs, because from this perspective the most sophisticated epistemological beliefs are located, on some level, in the world of human interaction.

5.1.3   Diachronic analysis —looking back to look forward

In order to examine the Vernon medium and make it 'strange' I decided to compare it with two more recent examples of pedagogical knowledge media, because looking backwards from the vantage point of increasingly digitised knowledge media provides a way to make the sensory affordances and constraints of mass–printed media apparent and provides clues about possible future knowledge trajectories. Therefore this research applies diachronic comparison as a methodology to compare the examples of pedagogical knowledge media being analysed in this research.

Not only does the diachronic analysis of these the three comparators offer opportunities for comparison but it also offers an extended historical perspective. From the perspective of affordances and constraints, one of the advantages of viewing knowledge and knowing retrospectively from an extended historical perspective is that it provides a vantage point from which to perceive communicative constraints. As Wertsch (1997) and Ong (1977a) both pointed out, it is usually only with the appearance of new, further enabling forms of mediation that it is perceptually possible to look back and recognise the limitations of earlier forms.

In order for diachronic analysis to function effectively as a strange making device I chose three comparators. The details and rationale behind the choice of the particular comparators are described in detail in Section 5.2. This current section focuses on what makes the chosen comparators diachronically comparable. The key common material element that unites the comparators is the variation in the degree to which the processes of digitisation have

contributed to their production, consumption and distribution cycles. The examples chosen have each been influenced by degrees of digitisation—the mass-print example has no digital elements in its production, consumption or distribution cycles, as opposed to the Wikipedia example that is fully digitised. This perspective of degrees of digitisation allows all three comparators to be examined on the same phenomenological plane—in particular observing the variations in the degrees of digitisation shows that the spatial and temporal distance between the reader and the writer, and between the sender and the receiver is changing.

Diachronic, phenomenological comparisons are at the heart of the theorising of both Ong and McLuhan and the broader field of media ecology (Anton, 2014). However, Ong (1986) claimed that most phenomenological comparisons of knowledge media are not truly diachronic but are, in fact, synchronic because most comparative analysis only considers examples that have been mediated within the noetic period of mass print. As discussed in Section 2.3, Ong argued that most 'time-based' comparisons do not take into account "how matters stood before writing" (Ong, 1986, p.17). From this perspective the methodological approach adopted in this chapter can be considered to be truly diachronic, not because it includes a comparison with a knowledge medium from the pre-literate, oral period, but because the Wikipedia knowledge medium is an example from the emerging post-mass-print period.

5.1.4   Epistemological beliefs —a way of thinking about knowledge

Until this point in the research, knowledge and knowing have been discussed in a general way. However the philosophical field of knowledge is sizeable, and most conceptions of knowledge are related to content. In order to consider the perceptual influence of the Vernon (1965) knowledge medium I needed to find a way of discussing the personal perceptual elements of knowledge.

My breakthrough in this respect came when I read the work of Hofer (2002), Hofer and Pintrich (1997), Schommer (1990, 1993a, 1993b, latterly Schommer-Aikin, 2012) about personal epistemological beliefs. As discussed in Section 1.3, according to Schommer-Aikin, learners' personal epistemological beliefs about knowledge and knowing can be examined along three specific dimensions. The first is based on the extent to which perceptions of knowledge range from highly certain to highly uncertain; the second is concerned with the extent to which knowledge is perceived as a collection of meaningless isolated facts or a series of personal constructs; and the third dimension is concerned with the extent to which

knowledge comes from a text or is based in reason. This heuristic of personal epistemological beliefs provides a framework for thinking about knowledge in very specific ways, particularly in relation to the shifts in perceptions of knowledge as changes to the degree of digitisation of knowledge media are occurring.

From this point onward the research takes a very particular view of knowledge by discussing it in terms of these three specific personal epistemological beliefs. As was discussed in Section 1.3, the heuristic of epistemological beliefs are used in this research in two particular ways. First, analysis of personal epistemological beliefs provides a theoretically informed way of passing a value judgment about whether or not some knowledge media mediate more sophisticated or mature forms of knowledge than others. Second, it provides a heuristic for breaking down and analysing specific perceptions of knowledge and knowing.

5.1.5   Comparing the modes that influence epistemological perception

In order to analyse specific elements of sensory experience, the focus now shifts from the overall form or general structure of specific examples of knowledge media to examine elements of their specific material composition by breaking them down into individual modes so that incremental acts of sensory engagement can be isolated and analysed.

Sections 5.3-5.5 analyse the three chosen comparators to show how sensory engagement with them mediates particular personal epistemological beliefs. In order to examine the influence of materiality on epistemological beliefs the framework, or lens, separates specific modal elements of the material composition of the three comparators into discrete components to form the research data. Using such data enables a mass-printed paper textbook from the mid-20th century to be compared on the same phenomenological plane as a digitised website. This consistency is important for diachronic analysis.

A particularly important element of this lens is that it is not only the *presence* of particular modes that are a highly significant component of the data, but also the *absence* of specific modes. For example, the absence of modes such as dates, time and references to current events gives the sensory impression that the content is stable.

The first sensory dimension being analysed modally is that of time—or lack of time. Analysis of this sensory dimension indicates the extent to which the medium mediates the perception that the content is stable or unstable. The influence of time is revealed by the presence or

absence of time related modes such as dates, specific topical references to current events, and the extent to which the disputes and reworkings involved in generating the medium are visible and current.

The second sensory dimension being modally analysed is space—or lack of space. The sensory experience of space mediates epistemological simplicity or complexity. The influence of space is revealed by the presence or absence of space related modes such as the consistency of the font size and type; the number and degree of integration of the images being used in the medium; the feel of the knowledge medium (for example, whether the paper is dense or flimsy); the extent to which the content has been sequenced in a systemised order of headings and sub-headings; whether the content can be remediated into other formats; and the extent to which locating mechanisms such as page numbers and indexing systems dictate the reader's flow of attention.

The third sensory dimension being analysed is sound—or lack of sound. This is the extent to which the medium facilitates the sensory experience of the voice of the other or others who are, to some degree, mutually engaged in the knowledge interaction. Ong describes this as the extent to which the presence of the author (or others involved in the knowledge "doings" (2012, p. 43)) are visible in the medium. Examples of these sound enabling (or limiting) modes include the extent to which the feedback loops in the medium mediate controlled or spontaneous interaction, and whether the voice of the knowledge participants is valued and encouraged in the medium. An important point in the modal analysis of sound is the extent to which the behaviour of the participants in the knowledge transaction is, in some way, modified (or not) in response to the others also engaged in coming to know. This is important because dialogic interaction is materially evanescent and it is only by examining altered responses and changes in behaviour between interlocutors that it is modally detectable.

5.2   Selecting the knowledge media for comparison

As discussed in Section 1.1, my interest in investigating the perceptual influence of the medium of knowledge on beliefs about knowledge was stimulated by the discovery of a 1960s classroom textbook *Human interaction: An introduction to sociology* in a storage cupboard. In order to make this medium 'strange' I decided to compare it to two other comparators: Carl, J.

(2010). *Think sociology.* Upper Saddle River, NJ: Prentice Hall and the Wikibook—

Introduction to Sociology (http://en.wikibooks.org/wiki/Introduction_to_Sociology).

Each of the chosen comparators is representative of the knowledge media available at the time of its production or creation, and of the production methods of its time. The production dates of these three examples of knowledge media range over close to a 50-year period—although the third, digitised example is different from the previous two comparators in that it does not have an explicit production date. The three comparators were (and are) all examples of pedagogical media used in contemporary Western classrooms. While the first two examples of knowledge media have been used in the formal educational context, the third had, until recently, been rejected as a valid pedagogical knowledge medium. However this is changing rapidly—as the literature review in Section 3.2.3 indicated, there are a number of indications that the Wikibook is now rapidly achieving credibility as a valid medium for engagement in the formal knowledge environment.

In order for the three comparators to be comparable on a diachronic continuum they needed some degree of material consistency. The primary material element that unites the comparators is their degree of digitisation. The Vernon (1965) knowledge medium had been shaped entirely by the mechanical processes associated with the mass-printing industry. The Carl (2010) medium was distributed and consumed by the processes associated with the mass-printing industry, but produced by the emerging processes of digitisation in the form of desktop publishing. The third knowledge medium was an entirely digitised sociology textbook formed using the collaborative digital processes associated with wikis.

There are several other material elements that allow these three comparators to be analysed on a continuum: they each have a number of the instantly recognisable features of traditional, systemised 'Ramist-style' pedagogical knowledge media; they each have a highly structured, carefully ordered layout in which the knowledge related to sociology is broken down into hierarchical, pre-established, highly sequenced subsections; each medium appears to be made up of pages—in the case of the Wikipedia medium the pages appear to be a component of the screen but, as this research establishes, pages and screens have very different affordances and constraints; and each medium, to a varying extent, uses a range of modes (such as images, diagrams and variations in font sizes) to support learning, and all use alphabetic text as the primary medium of communication.

The first two in particular are typical of the textbooks that have been mass-produced since the time of the original textbooks crafted by Peter Ramus in late 15th century France (as discussed in Section 1.5) and that have been widely used in Western pedagogical practice over the past 500 years. They are mass-printed on paper and distributed using largely traditional processes. They have an instantly recognisable and standardised textbook format. They were developed specifically for pedagogical purposes: in other words they present knowledge about the field of sociology as cut down or abbreviated in order to represent the knowledge in that field specifically for students. These knowledge media are both specifically designed to be used within a formal course of study.

The Vernon (1965) knowledge medium was produced using the technologies of moveable type—very much like those that emerged at the time of Gutenberg. It consists of 205 meticulously stacked, smoothly cut semi-gloss sheets of moderately thick paper. These pages have all yellowed with age, but when the medium was produced in 1965 the paper would have been off-white in colour. The sheets are encased—front and back—by a stitch-bound cover of relatively coarse cloth that has been stretched and glued onto rigid cardboard. The knowledge medium is dense and heavy, with physical dimensions of 190mm x 240mm x 35mm and a weight of 1.2 kilograms.

This knowledge medium is divided into carefully graduated sections and subsections, each of which has a bolded, concise heading. These headings are used as a conceptual organising mechanism throughout the medium, and have been carefully chosen to reflect the topic and the content of each sub-section. Each page is consistently divided into two justified columns. The only colours (other than the yellowing of the paper) are black, white, grey and the beige of the cover. Text is the dominant medium of communication, with minimal variations in font and type size and style throughout the medium. There are 40 moderately sized rectangular black and white illustrations, and ten simple black and white diagrams, and graphs dispersed throughout the medium.

There are no visible material irregularities in either the material composition or the print layout of the Vernon medium. The reproduction processes associated with this medium can be perceived as a process of mass-producing identical copies, much like a large postage stamp. No records remain of how many copies of this medium were produced but it can be assumed that thousands of absolutely identical copies of this medium were printed and distributed.

The Think sociology (Carl, 2010) medium (see Figure 2) was chosen from a number of other mass-printed knowledge media associated with the field of sociology that were stacked beside the Vernon (1965) medium on a shelf in my office. This knowledge medium was produced using the technologies of desktop publishing that had emerged by the turn of the 21st Century. This shift in presentation style from Vernon (1965) to Carl (2010) reflects the dramatic changes in printing technology that took place between the two publications. The affordances of desktop publishing and just-in-time print runs meant that attention could be paid to producing a product with a high level of rhetorical impact.

It was specifically designed to resemble a magazine, with a highly varied, lavish, multi-modal format and almost every page includes at least one four-colour photograph, chart or diagram. It consists of 175 pages of light, gloss-coated paper. The external cove r is of a slightly denser but still flexible stock. Its physical dimensions are 23 centimetres x 27 centimetres x 1.5 centimetres. It weighs 750 grams.

This image has been removed by the author of this thesis for copyright purposes.

Figure 2 Carl, J. (2010). *Think sociology*. Upper Saddle River, NJ: Prentice Hall—Front cover

The Carl (2010) medium is one of a range of magazine-style publications that were produced between 2010 and 2014 by Pearson Education publishing at Prentice Hall. This range is marketed under the name ThinkSpot™ and is in a contemporary magazine-style format that uses a four-colour, glossy, teen-oriented presentation.

ThinkSpot™ knowledge media are published across a number of humanities topics such as sociology, public relations, interpersonal communication and psychology. Limited information about publication figures is available.

Digital technology has had a profound influence on the production processes associated with this medium but the distribution and consumption cycles for the Carl knowledge medium remained largely the same as those used in the 1965 Vernon medium. Although there is the

facility for students to purchase a code that allows them to access an online version and online teaching resources, the primary engagement with the medium is through the printed version (M. Loveridge, personal communication, March 7, 2015).

Choosing the third and most recent comparator as an example of a current pedagogical knowledge medium in the field of sociology was more difficult, and reflects the intense transition that knowledge media are undergoing. I was familiar with an emerging genre of fully digitised knowledge media such as the FlatWorld™ series that offers textbooks at a reduced price in a flexible, fully downloadable format. According to the FlatWorld ™ promotional literature, their products have been highly successful and are being widely used in over 2500 learning institutions worldwide across a range of subjects including business, economics, humanities and social sciences (Snyder, 2008). However, after closely examining this digitised medium, I rejected its validity for my research on the basis that it did not reflect emerging trends in knowledge media: on close examination the FlatWorld ™ products are more akin to traditional knowledge media because they position knowledge seekers as recipients of a top-down, pre-established knowledge base which confines knowledge seekers to one standalone medium that will need to be 'mastered' to some degree in order to complete a specified course of study.

I wanted to analyse a knowledge medium that was indicative of emerging ways of knowing. My choice for this analysis was a wiki-style knowledge medium, in particular the sociology Wikibook (http://en.wikibooks.org/wiki/Introduction_to_Sociology). As discussed in Section 3.3 this style of knowledge medium is rapidly emerging and gaining credibility in a formal teaching context. Although the wiki-style knowledge medium has many of the features of its traditional mass-printed equivalents, it represents a major shift because it exemplifies the 'bottom–up' knowledge environment, and is part of an organic and growing movement that is explicitly seeking to democratise and decommodify knowledge through actively encouraging user participation and open access. It is a database of pages that contributors can edit in real time.

Wikibooks (previously called the Wikimedia Free Textbook Project and Wikimedia-Textbooks) is an open access project that is hosted by the Wikimedia Foundation for the creation of free content textbooks and annotated texts that anyone with sufficient motivation can edit. It is important to note that this research project is focused on the English version of the wiki knowledge medium, which is used by predominantly Western users. Yasseri, Sumi,

Rung, Kornai & Kertész (2012) show that there are significant variations in how different cultural groups engage with the medium. For example, interpersonal interactions, particularly patterns of conflict, vary across different cultural groups using the wiki platform.

Two major methodological issues arose with the choice of the sociology Wikibook knowledge medium as the third comparator. The first was that, although I wanted to examine a knowledge medium that showed elements of the emerging changes in the digitised knowledge sensorium, I needed a medium that had some degree of analytic continuity with the earlier two examples. In other words, in order for the 'strange-making' process to be valid it was necessary to select a knowledge medium that had sufficient mutual elements in order for it to be able to be compared along common axes. Each of the media selected for analysis needed to be, in some respect, a formal pedagogical knowledge medium. The sociology Wikibook knowledge medium was suitable because, although it is an example of a new medium, it is increasingly being used within formal pedagogical settings (as previously discussed).

The second issue that arose with the choice of the sociology Wikibook was that that there are two groups of knowledge seekers who engage with the Wikipedia knowledge medium. There are those users who engage with the top, content level. Then there are those who engage with the deeper, more participatory levels of content creation and collaboration, and discussions about the form and usage of the medium. The analysis showed that by far the majority of the users of this Wikibook only engage with the top, most visible layer of Wikipedia and do not actively participate in the knowledge creation process. For those who do engage with the collaborative aspects of Wikipedia, all editing and content changes are carried out behind the scenes on the talk and edit pages, and are then moved to the main content page once they have been through a process of peer review. However, even knowledge seekers who only engage with the top, stable level of the sociology pages are given numerous clues through hyperlinks and invitations to 'edit' that beneath the surface are deeper, more collaborative levels of engagement—clearly visible on the main sociology page are a series of hyperlinks that connect to a number of interactive editing and contribution facilities. Therefore, although not every user of this medium engages with the deeper, collaborative aspect of the medium, these collaborative elements are, on some level, part of the sensory experience of Wikibooks for all users.

The sociology Wikibook, the most recent knowledge medium, is different from the other two comparators in a number of ways. It is not written by a single author—in fact, it has been

written collaboratively by a group of contributors. It is not visually laid out in front of our eyes
"ready to be explored" (Ong, 2012, p. 73), but instead reflects the emerging trend for
knowledge seeking to be located in a series of digital knowledge communications and
interactions across a range of media rather than in a single, standalone artefact. The Wikibook
knowledge medium exemplifies the more wide-ranging, self-directed kind of knowledge
engagement that students are experiencing today.

The sociology Wikibook is produced by entirely digital, open access technology—although a
PDF version can be downloaded for hardcopy printing, and a formally printed and bound
version is available for purchase. This medium consists of separate levels of metadata that are
connected by hyperlinks. The top (and immediately visible) layer is the most recent iteration of
the content. It consists of vertical and horizontal navigation bars, links to content topic pages,
links to references and links to related topics. Underneath this are several other layers. The
'Talk' layer is used for process discussions such as ways to improve the knowledge medium,
and the 'Edit' layer is where participants contribute to the content and to the form. A copy is
kept of each iteration of the changes that individual contributors make to both the 'Edit' and
the 'Talk' layer, and users can revert to previous versions at any time. While most knowledge
seekers using the Wikibook engage with the top layer of content, the levels below, and the
historical and unfolding micro-interactions between participants in these levels, are part of the
sensory experience of this medium. Numerous clues that refer to the deeper collaborative
processes are visible on the top layer.

5.2.1   Introduction to sections 5.3 - 5.5—analysing the comparators

The following analysis (sections 5.3 – 5.5) identifies and diachronically compares the specific
ways that changes to the modal composition of the three chosen pedagogical knowledge media
are influencing the sensory experience of knowledge, particularly as the modal composition
becomes increasingly influenced by the processes of digitisation.

The sensory framework of time, space and sound is used to structure and differentiate the
modes that have been selected for analysis. The first sensory dimension (time - Section 5.3)
provides a way of identifying and examining how the material composition of the medium
mediates the perception that the content is stable or unstable. The second sensory dimension
(space - Section 5.4) provides a way of identifying signs of epistemological complexity based
on the extent to which the sensory engagement is spatially contained within one stand-alone

medium. The third sensory dimension (sound – Section 5.5) examines the extent to which the knowledge medium mediates the sensory experience of the voice of the other or others who are, to some degree, mutually engaged in the development of the medium.

5.3   Stability: Absolute versus constantly evolving knowledge

Section 5.3 analyses the presence (or in this case absence) of compositional modes specifically related to the temporal elements of knowledge in the three examples of knowledge media chosen for comparison. Temporality is central to Schommer's (1990, 1993a, 1993b, latterly Schommer-Aikin, 2012) epistemological dimension related to beliefs about the stability of knowledge. The way that time is expressed or experienced through the knowledge medium significantly influences beliefs about the extent to which knowledge is perceived to be absolute as opposed to constantly evolving and subject to change. At one extreme of this epistemological dimension, where knowledge is perceived as stable, is the belief that the world can be known with certainty, and that things can remain true forever. At the other end of the continuum is the recognition and acceptance that knowledge is constantly in a state of change, and that claims for absolute truth should be treated with suspicion.

5.3.1   Time and the 1965 knowledge medium

In the 1960s the industrial processes associated with designing, printing and circulating mass-printed knowledge media were lengthy and drawn out at all levels of their production and distribution cycles. Each new print run was resource intensive and often hazardous, requiring a highly specialised technical and physically active labour force. All aspects of the publishing process required lengthy communication cycles that often extended over weeks and months — for example, the negotiations involved with obtaining permissions and copyright clearances, and processes such as assigning ISBN numbers. By the time of its arrival in New Zealand, the Vernon (1965) knowledge medium would have spent weeks, perhaps months, in the hold of a ship as it was transported to New Zealand from the US. From there it would have been stored in a warehouse until it was finally dispatched to the university if pre-ordered, or displayed on a bookshop shelf awaiting sale.

The drawn-out production and distribution cycles had significant implications for how this knowledge medium mediated perceptions of the stability of knowledge. The high costs and extended timeframes associated with mass printing in the 1960s provided a considerable

motivation for the publisher to extend the longevity of the knowledge medium. It was in the interests of the publishers to extend the market relevance of the medium for as long as possible in order to maximise the number of sales from each print run, and therefore maximise return on investment. For example, although no specific records remain, when the 1965 knowledge medium was printed it was considered to be financially prudent to maximise the print run and sell any excess in remainder bins in preference to losing sales by exhausting the stock (Cooper, 2012).

The need to maximise the print run by extending the lifespan of the content has had a significant influence on the modal representation of time in the 1965 knowledge medium. In order to reduce perceived redundancy of content the inclusion of any clues that locate the medium in time are minimised. Almost no dates are included in the knowledge medium's 25 chapters, with the only dates included being those that are part of the academic referencing system that names the contributing authors and the dates of their publications in small (8 point) italicised Times Roman font as footnotes on each page. Some of these references are also included in the 'SUGGESTED READING' section at the end of each chapter. These works' publication dates are clearly separate from the main content of each chapter and are positioned as a required response to an academic convention rather than as a recognition of the epistemological appropriateness of locating the content in time.

This absence of temporal locators in the content of the Vernon medium is a pattern that is generally repeated throughout all 25 chapters. For example, in Chapter 14, titled "Collective or Unstructured Behavior" (pp. 193-211), no dates are included in the entire 20 pages except (as discussed above) as part of the referencing system. The same pattern is evident in Chapter 15, titled "Motivation" (pp. 212-225). Chapter 2, titled "The Norms of Science" does contain four dates in the content. However these dates are not used to locate the content in the present, but rather are included as part of a broad historical commentary on the field of sociology. For example, "Scientific truth as taught to college students during the 1960s is quite different from the scientific truth taught during the 1860s" (p. 33).

The date of publication of the Vernon medium is located once in the front matter on the copyright page, and once more at the end of the preface. These dates are separated from the main content section. In the back matter there are no dates at all.

The material composition of the Vernon knowledge medium is highly durable. Other than
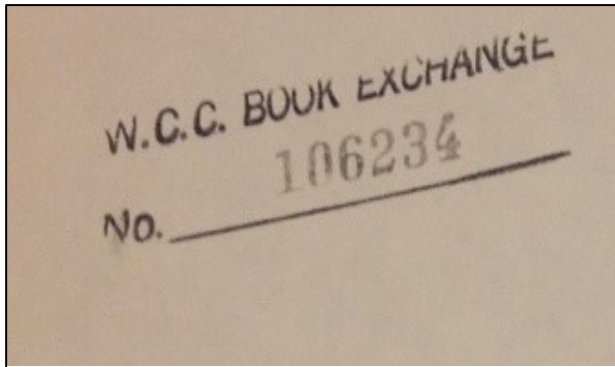

Figure 3 One of the two stamps inside the front cover of Vernon (1965).

some fading on its spine and yellowing of pages, this medium has survived for 50 years and, judging by its well-preserved state, it could continue for a considerable period to come.

According to available records, at the time of publication this knowledge medium retailed for $US7.50 (Miller, 1966). In 1965 this was a considerable amount of money, especially because the cost of shipping and conversion to local currency made the price of this knowledge medium even more expensive for New Zealand students.

One of the mitigations for requiring students to make the significant financial outlay involved with purchasing this knowledge medium was that it could be on-sold by the student at the end of the course. Evidence (see the stamp in Figure 3) suggests that the 1965 medium had sufficient on-going material value that after its original purchase it was on-sold to at least two further owners. The name of the assumed original owner was handwritten at the top right-hand corner of the inside cover (this name has since been inked out). No records remain about how much the medium was on-sold for.

It is significant to note that in neither of these stamps is the date included. This was, presumably—and probably unconsciously—to reduce redundancy in the content.

Today, approximately 50 years after it was first published, this medium continues to have value: an Amazon search reveals that six copies of this knowledge medium (both the first and second editions) can still be purchased for prices ranging from US$4.95 to US$53.39. From the Amazon description of the two books, there is no obvious explanation for this significant range in price.

A key reason why it was considered expedient to strip the Vernon (1965) knowledge medium of as many dates as possible was the desire to maximise the perception of temporal currency. The Vernon (1965) knowledge medium was its first edition. While its date of publication is referenced by the author in the brief foreword, as discussed above, the time

needed to gather and prepare much of the content prior to publication must have been considerable. Once the linotype was set and the printing process was under way the content of the knowledge medium could no longer be modified until the time of the next print run which, in the case of the 1965 medium, was five years. Therefore, by the time this edition went to print the content had been gestating, in some form, for approximately 10 years and, at the time it went to press, it was potentially already out-dated. This contributed to the publisher's desire to minimise the inclusion of clues that temporally locate the medium—at least over the five-year period between editions.

The protracted production and distribution cycles associated with this medium meant that any temporally located references could diminish the ongoing value of the Vernon (1965) knowledge medium and therefore these were minimised. As a consequence of these material constraints, the publishers avoided making claims of newness of content. In the medium any 'stories' it included are archetypal and impersonal—they are treated as 'extras' to illustrate the main meaning. In other words, knowledge seekers are introduced to the 'substantial' or important knowledge (the theory) first and the stories are used as cases to illustrate the theory.

The need to avoid redundancy of content influenced the nature of these cases or stories that the author used to illustrate the theoretical points within the content of the medium. Most notably, within the medium there are few references to current events. The author locates illustrative examples in a geographical context, but no attempt is made to temporally locate them—instead the examples are presented as a generalised event that is not located in a specific timeframe. This can be seen in the following example:

> In a stable society, most members enter most situations with fairly clear definitions of the expected behavior. When the typical American college student attends the Junior Prom, he enters the ballroom ready to participate in the appropriate way. He dresses appropriately, he knows the ritual involved in taking care of the wraps (he even knows that on this occasion they are wraps, although the same clothing in other situations are merely coats), how dancing partners will be selected, the proper type of dancing, types of conversation in which to engage, etc. Throughout the week as he moves from the dorm to the classroom, to the football game, to the movie, and to church services on Sunday, he has a well-established awareness of the appropriate plans of action, and in most cases his behavior conforms, more or less, to these plans. He plays the appropriate role. (p. 183)

Vernon (1965) makes frequent use of stereotypical and allegorical stories to support the theoretical points he is making. In some cases these are loosely attached to a timeframe, but this is always positioned generally in the past. In the example below, Vernon makes the

theoretical point that responses to the same empirical stimulus may be quite different for different individuals. He supports this theoretical point with a story that is temporally located 20 years earlier in the period of the Second World War. The story is based on highly stereotypical characterisations.

> "The importance of definitions in human behavior is suggested in the following story:
>
> Sharing a railway compartment were an American grandmother, her young and attractive granddaughter, a Romanian officer, and a Nazi officer. As the train passed through a tunnel no one spoke but they all heard a loud kiss and a vigorous slap. After the train emerged from the tunnel nobody spoke but the following reactions occurred.
>
> Grandmother: What a fine girl I have raised. She can take care of herself. I am proud of her.
>
> Granddaughter: Well, grandmother is old enough not to mind a little kiss. Besides, the fellows are nice. I'm surprised what a hard wallop grandmother has.
>
> Nazi officer: How clever these Romanians are. They steal a kiss and have the other fellow slapped.
>
> Romanian officer: How clever I am. I kiss my own hand and slap the Nazi.
>
> Response to the same empirical stimulus may be quite different for different individuals, man responds to his definition of the stimulus rather than directly to the stimulus per se. (p. 83)

In summary, from a material perspective, the important point is that there are very few modal indicators of time in the Vernon (1965) knowledge medium. There are almost no dates and few references to current events. The protracted production cycles associated with this medium meant that any temporally located stories or references to current events could potentially diminish the ongoing value of the knowledge medium and therefore it was considered prudent from a marketing perspective to minimise them. Vernon often locates stories or examples in a geographical context, but no attempt is made to temporally locate these stories or examples. This positions the content of the medium as existing outside the contextualising influence of time, and has the effect of presenting what is known about the field of sociology as a stable, unchanging body of knowledge.

5.3.2   Time and the 2010 knowledge medium

The modal composition of the 2010 pedagogical knowledge medium (Carl, 2010) mediates the perception that its content is located in the present to a greater extent than that of the Vernon

(1965) knowledge medium. The Carl medium is designed in a magazine-style format in which the content is generally light and entertaining. The Carl medium's stock is flimsy and the pages curl at the corners. The prominent barcode on the front cover mediates the idea of ease of purchase and consumption, and that this medium is a disposable commodity.

The Carl (2010) knowledge medium includes more specific references to dates than the Vernon knowledge medium—for example, Chapter 2 includes mention of 15 dates in 18 pages. The medium also makes claims to freshness of content through numerous references to recent contemporary and highly topical social issues and media personalities. For example, it refers to the removal of 200 children from the El Dorado Ranch in 2009 (p. 9), and to the tussle between Hillary Clinton and Barack Obama for the Democratic nomination in 2008 (p. 49). As another example, Chapter 14 of Carl (2010) also includes specific reference to data from the 2006 US census.

From a publishing perspective, the decision to temporally locate the content in the present was a direct response to the changing production processes associated with desktop publishing and the reduction of the length of time between print runs. When the Carl (2010) knowledge medium was published the technologies of desktop publishing had made small print runs technically easy and financially viable. 'Just-in-time' printing meant that knowledge media could be regularly reprinted with numerous, possibly minor adjustments. This meant that the financial incentives associated with extending the duration of each print run were significantly reduced. For example, the Carl (2010) medium was reprinted in 2012 and then again in 2014 with a different cover and updated indications of dates – in stark contrast to the Vernon medium's publishing chronology.

As is frequently the case with contemporary magazine-style forms of presentation, the front cover of Carl (2010) is dominated by a large, centrally placed and glossy photograph of a young woman. The image is filled with youthful vigour. Her gaze is direct. She is wearing headphones, has tousled wind-swept hair and is laughing, as though she were in the middle of a dance move (as shown in Figure 2). This image mediates a sense of excitement, immediacy and intensity.

This image is surrounded by a number of highly insistent imperatives expressed in large, varied and bolded fonts. These statements are directed at the reader and are expressed in the present tense. For example the masthead makes the direct order to "THINK: SOCIOLOGY!" The large, stark, sans-serif font used in the word THINK has a shadow under it that foregrounds the

title, and draws the reader into the image by implying a more urgent and engaged experience. Most of the text on the front cover is black. A red font is used to differentiate and emphasise the author's name, the publisher's name, and the middle letter 'I' of the title word THINK. These varied and intense modal variations mediate a sense of drama and action. This is a deliberate attempt by the publishers to position the content as fresh, new and relevant.

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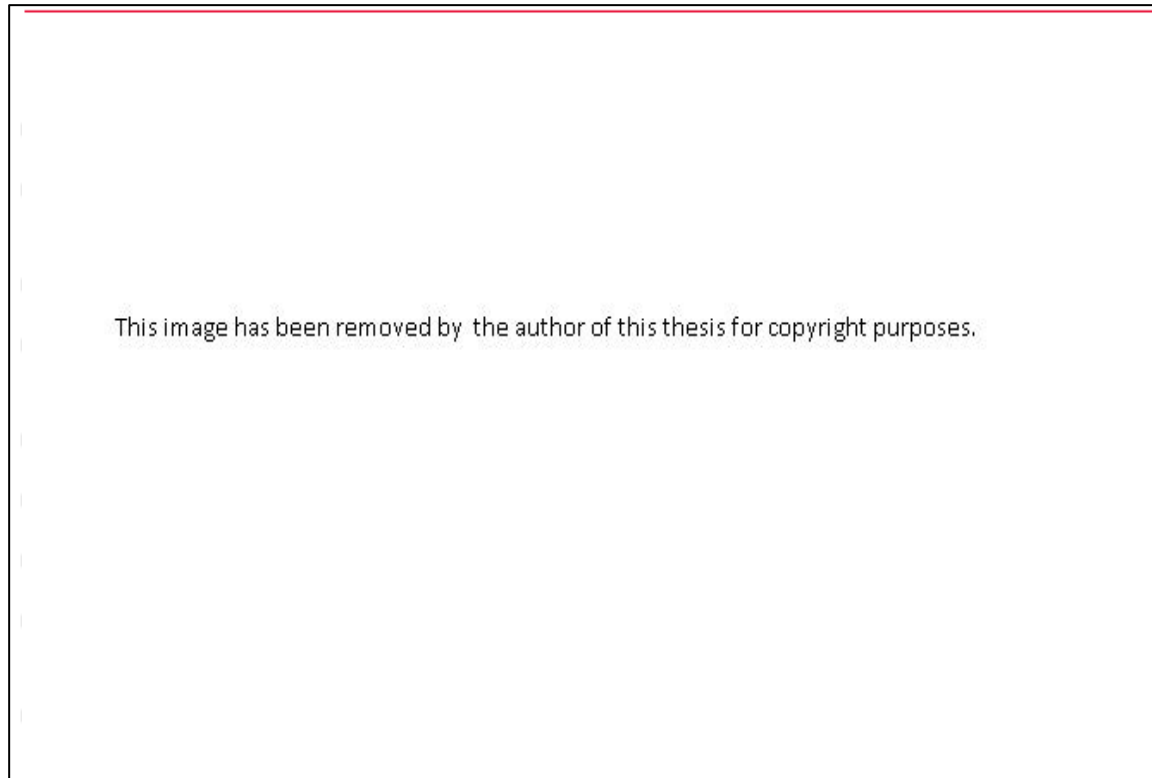
Figure 4 Carl, J. (2010, p. 45). *Think sociology*. Upper Saddle River, NJ: Prentice Hall—list of external resources.

The front cover also makes highly visible use of colloquial, youth-oriented contemporary words such as "peeps", "all the rave!" and "txt talk". This temporally locates the knowledge medium in the contemporary scene, and is reinforced by specific and frequent reference to highly temporally sensitive elements of 'pop' culture such as silent raves and flash mobs, and visual clues such as the 'hi-tech' headphones that the girl is wearing in the photograph. From a publishing perspective, these temporally sensitive references to language and technology are a deliberate acknowledgement of the fleeting value of the Carl (2010) medium.

At the end of each chapter of Carl (2010) there is a series of hyperlinked resources. This inclusion of external references in Carl has a similar effect to Vernon's (1965) reference list in mediating broadened perceptions of the data set that is available to the knowledge seeker. However, the inclusion of hyperlinks in the Carl medium also has implications for sensory

impressions about the role of time in the knowledge medium. From a sensory perspective an interesting feature of the list of the nine hyperlinks (shown in Figure 4) is that on 16 March, 2015, three of these links were no longer active. In the 1960s, when the Vernon knowledge medium was published, this would have had significant consequences for the perceived ongoing value of the medium because it would have mediated the idea that the content was outdated.

This ceases to be so significant in the 2010 medium. Readers of the Carl medium perceive that it has a limited lifespan. The fact that the links are in a constant state of change is a given, and does not particularly diminish the value of the medium.

Even though the more frequent print runs limit the shelf-life of the Carl medium compared with the Vernon medium, the former has continuing value. Although its value has diminished the 2010 edition continues to be on-sold via Amazon. On February 8, 2011, one student reported that she was able to resell it on Amazon, did not lose much in price, and was able to put the funds received towards new books for her next classes (Amazon, 2015).

In summary, compared with the Vernon (1965) knowledge medium, the Carl (2010) medium shows clear evidence of a loosening of the demands of durability. The more immediate production and distribution processes associated with the development of its material composition meant that that there was not the same concern about redundancy of content in its production processes. There is an increased number of modal indicators of time in the Carl (2010) knowledge medium including numerous references to dates, frequent references to current events and a number of time sensitive hyperlinks. This inclusion of temporal locators positions the content of the medium as existing within the contextualising influence of time, and has the effect of presenting what is known about the field of sociology as an unfolding body of knowledge.

5.3.3   Time and the wiki knowledge medium

In contrast to the Vernon (1965) knowledge medium and, to a lesser extent the Carl (2010) medium, the wiki knowledge medium is highly temporally sensitive and highly unstable. For users of this knowledge medium the sense of time, and the sense that knowing is located in time and is in a constant state of unfolding, is part of the sensory experience of coming to know in a way that was not the case with the previous two examples. The content is presented as

being in a constant state of flux rather than being a final, complete and retrospective account or record.

On the Wikibook main content page there are a number of perceptual clues that temporally locate the content and that present it as being in a state of ongoing development. It is significant to note that in the Wikipedia knowledge medium not only are the dates of individual contributions clearly visible but also the hours and minutes. At the bottom of every Wikipedia page is the message, "This page was last modified on 10 April 2015, at 03:22", for example.

Another example of this temporal location is that, beside each topic that is listed on the top or content level is a coloured 'development stage' indicator that reflects the extent to which the content is perceived to be fully developed. Development stage icons (see Figure 5 below) are

Wikibook Development Stages				
Sparse text ⊞	Developing text ⊡	Maturing text ⊞	Developed text ⊞	Comprehensive text ⊞

Figure 5 Wikibook grid of stages of content development

indicators of the progress of the content as reviewed at a certain date. They are placed beside the content to help readers identify the comprehensiveness of the content and to indicate this to those engaged in the development of the content that it needs more attention. In the example of the sociology Wikibook (May 01, 2015) there are 24 chapters that have the green icon displayed beside them, which indicates a high level of development. Nine further chapters are less well formed. It is significant to note that one of the features of all the pages that have been deemed well developed (or deserving of the green icon) is that they have each had a number of contributors over an extended period of time.

While there are numerous perceptual clues that temporally locate the medium on the top 'Book' level, a sense of dates and times is most obvious in the 'revision history' layers that sit behind the top level or main content page. On these pages the exact date and time of all individual changes is recorded. For example, unregistered user 173.168.25.232 made a change at 01:23, 14 January, 2015. Compared with the two examples of knowledge media, the Wikibook conveys the sensory impression that this medium is in a state of ongoing construction. For example, the first person to begin assembling the *Introduction to Sociology*

Wikibook was 'JXN'. On October 2004 at 4.35 pm, JXN wrote that he or she is providing a "vague outline for definition of sociology". Since that time there have been numerous other contributions and changes. By May 17, 2010, the sociology Wikibook had been edited 5466 times. More recently the rate of editing has slowed considerably. On May 4, 2015, the main contents page included the header "Last edited two days ago by an anonymous user".

Another important way that the sensory experience of time is mediated in the Wikibook environment is by the rate at which the discourse flows through the medium. Interaction within the Wikibook knowledge environment is more immediate and interactive than in the previous two examples. In the Wikibook knowledge medium the content that has been most altered or otherwise engaged with is the most valued. The pages that are most changed or revised are given special status in the form of prizes that are awarded for 'freshness' and degree of contribution. It is significant to note that, even in the face of the lack of permanence, in the wiki knowledge environment, contributors engage in the Wikipedia creation process with enthusiasm. In other words it does not seem to concern contributors that their contributions may be changed by others.

The speed of the feedback loops in the Wiki-based knowledge medium mediate the perception that it is acceptable to be spontaneous and experimental when engaging with it. The shift from the two-dimensional pages of the previous two examples to the more engaged interaction of the Wikibook medium suggests a more physically active experience of knowledge engagement. Each page includes hyperlinks that take the user instantly back and forth within the medium.

This more impulsive interaction is leading to a reduction in what Eisenstein (2013) and Poster (2007) describe as the 'reflective gap' that was mediated by the drawn-out production processes associated with mass printing. Eisenstein claimed that this reflective 'gap' is highly epistemologically significant because it privileged the rhetoric of detached neutrality that was associated with the epistemological beliefs of modernism. The 'gap' enabled the sender to privately compose, and the receiver to consider and judge the words of others "without his or her overbearing presence" (p. 61). Buber (2002) argues that this reflective gap limits the potential for dialogue to bring about deep emotional connection with others.

An analysis of the Wikibook knowledge medium indicates that there is increased capacity for greater spontaneity in interaction than in the previous two examples of knowledge media. One of the epistemological effects of the increased rapidity of the feedback loops in the Wikipedia

knowledge medium is that the speed of the interaction between participants is becoming increasingly more impulsive and spontaneous. Those who engage in the knowledge medium expect, on some level, to receive a response. In this way lack of response has meaning in a way it did not in the previous two examples of knowledge media (this is further discussed in Section 5.3.3). Those using the site are encouraged to 'pitch in and have a go' with the assurance that their contributions are conditional, not absolute. New contributions are immediately public, but they are in a constant process of review and checking for accuracy by a group of fellow contributors who are notified of any changes through RSS feeds. In addition, a volunteer peer-monitoring team 'patrols' all newly created articles every 30 days to ensure validity and comprehensiveness of information. These groups of self-motivated Wikipedians examine updates, and remove 'false' facts or offensive 'vandal' content.

An analysis of the Wikipedia knowledge medium shows an increasing use of casual, conversational forms of engagement. From a temporal perspective these range from rapid exchanges of abbreviated utterances between interlocutors who appear to be comfortable interacting with each other on an informal basis, to more extended and formally expressed exchanges between strangers in which a contribution or query may not receive any feedback for months. Whereas in the case of Vernon and Carl's mass-printed knowledge media it was inappropriate to express intense emotions or 'the raised voice', the increasingly rapid exchanges between those engaged in the Wikibook environment show an increased acceptance of a more direct idiom and the inclusion of emotions such as impatience and irritation. Although this is an example of a more agonistic tone of interaction between contributors it is important to note that the culture of Wikipedia is a high degree of interpersonal politeness, and therefore while emotions such as pleasure and enthusiasm are frequently sensed anger is rarely expressed. This is further discussed in Section 5.3.3.

From a curriculum perspective, the constant fluctuation in content poses challenges for users of the sociology Wikibook as a formal pedagogical knowledge medium, because a key article that may have been chosen by the teacher for inclusion in a formal programme may have changed by the time the student accesses it. However, because the various iterations are clearly marked with the time and date that they were created, this allows for some degree of consistency where the medium is being used as a formal classroom text. Changes can also be viewed in the revision history section of the *Introduction to Sociology* knowledge medium. The default view is from newest to oldest, therefore the most recent changes will appear first—although the user

has the option to reverse this view. In this way the user has the option to select the two revisions they want to compare and the option to 'undo' the change. Being able to view this history brings about a direct awareness of the temporal development of the content.

Another sensory indication of the instability of the medium is that it has the potential to be remediated across a range of technological platforms. This means that the way that dates and times are presented in the medium varies depending on the particular technology platform that is being used. For example, the format and appearance of the dates and times vary if the content is being remediated for a mobile phone or an i-Pad.

In this more unstable knowledge environment citing poses a challenge. Wikipedia resolves this by providing a facility where, if an article exists at a particular point in time, the permanent link in the sidebar navigation provides an address for the current revision of the page. Not only is the exact moment that each change is made to the medium permanently recorded but users can choose to search past iterations. All changes can be seen and tracked and previous versions can be easily accessed and recovered, allowing the user to compare various versions.

The Wikipedia knowledge medium is free of charge for users (although the Wikipedia Foundation do send out annual requests for donations). This has direct epistemological implications because it reduces the motivation to extent the commercial relevance of the medium. Unlike Vernon (or even Carl), the authors of the Wikibook medium do not need to worry about a forthcoming event that could make the knowledge medium outdated, as the Wikibook has the potential to change immediately in response to change. Therefore there is no attempt to disguise the fact that the content is in a constant state of flux rather than a final, complete, retrospective account or record.

In summary, in the Wikipedia knowledge medium modal references to time are highly visible; in fact time is integral to the epistemological experience. Compared with the Vernon (1965) and the Carl (2010) media, the sense of the temporality of knowledge is significantly heightened. There are numerous temporal modal indicators, in particular specific references to dates and time, and numerous feedback loops that encourage unstructured, increasingly impulsive and spontaneous interaction. Those who are engaging in the knowledge medium expect, on some level, to give and receive a response. This medium locates what is known about sociology as a collaborative field of knowledge that is constantly evolving and subject to change.

5.4   Space: Simplicity versus complexity

The second sensory axis that is applied in order to analyse the three selected examples of knowledge media is space. According to McLuhan (1994), the written word profoundly influenced perceptions of the spatial dimension of knowledge because it provided a static, confined container in which ideas about the world could be stored and shared. The conventions of mass print required these static forms to be formally laid out so that they could be printed en masse. This 'laying out' of knowledge has given rise to the linear, quantitative perceptions of knowledge that are prevalent today (Ong, 1977a, 2012; McLuhan & Powers, 1993).

Section 5.4 analyses the presence of compositional modes specifically related to spatial elements of knowledge in the three examples of knowledge media chosen for comparison. Examples of these compositional modes include the density, weight and visual uniformity of the medium. This Section also discusses the absence of specific compositional modes related to space, for example the absence of modes that mediate engagement between the readers and knowledge sources outside the confines of the medium.

Perceptions of the spatial component of knowing have a significant influence on beliefs about knowledge, particularly the extent to which knowledge can be regarded as a structured series of decontextualised, abstract facts that exist independently from the social world, as opposed to located in, and contingent upon, the wider social context (Schommer, 1990, 1993a, 1993b, latterly Schommer-Aikin, 2012).

5.4.1   Space and the 1965 knowledge medium

The modal composition of the 1965 pedagogical knowledge medium (Vernon, 1965) mediates the perceptual impression that coming to know about the field of sociology is a process of moving sequentially through, and mastering, a pre-established knowledge base that is valid even when it is decontextualised from the wider world. From a media ecology perspective this sensory impression is a response to the material composition of the knowledge medium—and the material composition of the medium is a result of the production, distribution and consumption cycles associated with the medium of mass print.
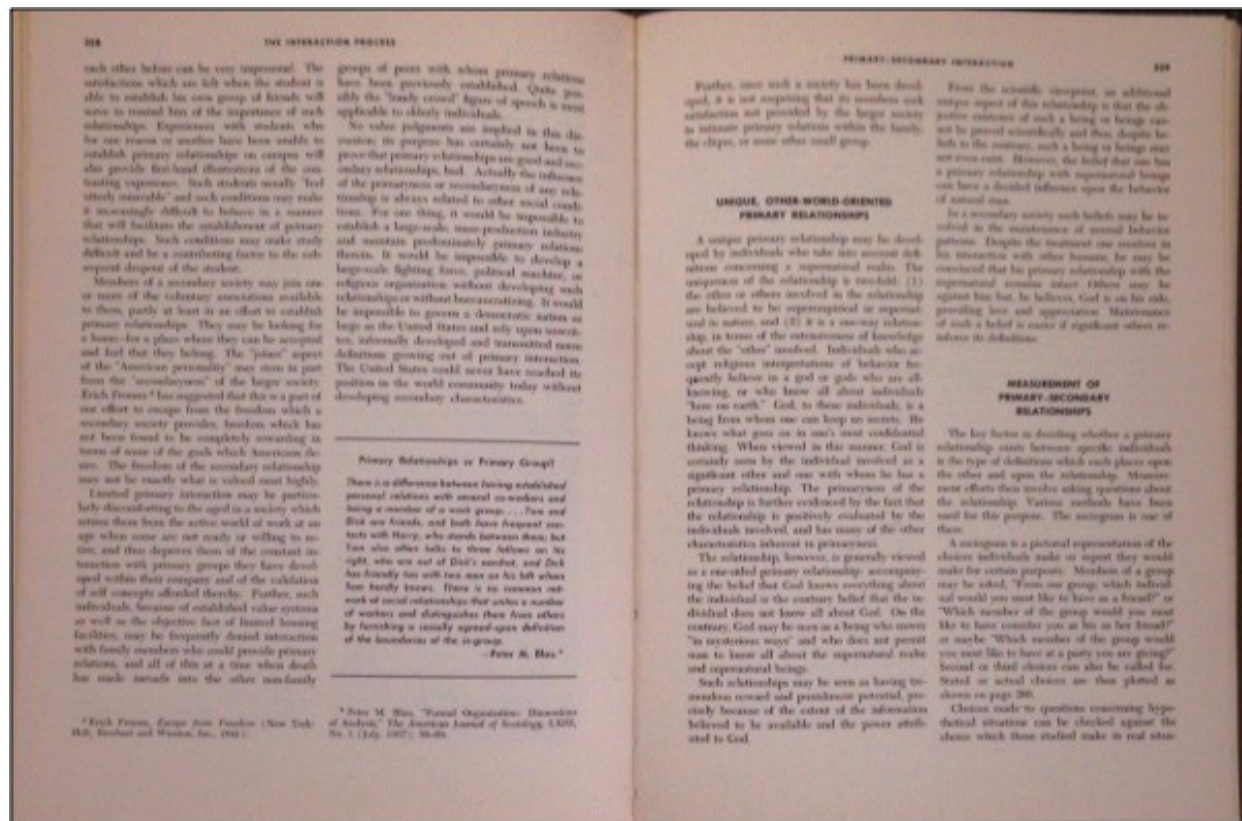
Figure 6. Example of full page layout (Vernon, 1965, p. 35)

The density, weight and highly consistent formatting of the Vernon knowledge medium creates an impression of carefully considered and structured content. Its material composition is comparatively dense and heavy. It is encased in thick, rigid cardboard overlaid with coarse cloth. Inside this external covering the content is divided into 25 clearly defined chapters, with chapter lengths varying from 11 to 18 pages. Each page is visually uniform.

The content of each page is separated into two evenly positioned, visually aligned columns. There is a 2.5 centimetre gutter between each column. Within each column the text is justified, with some use of hyphenation to achieve this highly consistent alignment.

As can be seen in Figure 1 the front cover is stark and simple. It is limited to the title, subtitle and author's name. Other than one small, star-like asterisk on the spine there are no illustrations or decorations. The eight words are written in a large simple silver font against a plain beige background. The title is capitalised: "HUMAN COMMUNICATION". The subtitle is written in lower case—although the first letter of each word is capitalised ("An Introduction to Sociology"). These words are left aligned in the upper centre of the cover.

Throughout the medium there are limited, but highly consistent, variations in font types and sizes. The font sizes are carefully and consistently graduated. All chapter titles are 18 point and flush left. The subtitles are 14 point, capitalised and centred. The section titles are smaller 12 point and capitalised, and are consistently positioned flush left. For example, Chapter 10 ("Self Definitions") is 17 pages long, divided into 14 sections, with six sub-headings. Each sub-heading is consistently written in a bold 12 point sans-serif font. This consistent graduation shows that the relative significance of each section of the content has been pre-established and the route through each section has been pre-planned.

Each section begins with a heading that has been carefully considered to provide the reader with a conceptual framework for what will follow in the chapter. These headings provide an overview or entry point into the general subject areas. Examples of the headings include "Self definitions and role definitions" (p.138), "Self definitions and personality" (p.139) and "Self definitions and possessions" (p.139). This careful predevelopment and order means that the reader is expected to move in a structured way from one section to the next, and there is a pre-developed order that the reader is expected to follow. Similarly the first sentence of every section provides a preview of the forthcoming content. "Culture, then, is not a mystical 'thing' that exists independently of human beings" (p. 91), and "A point of interest to the social scientist is the question as to the origin of value definitions and the process by which individuals or groups come to endorse particular value positions" (p. 105).

The modal composition of the Vernon medium complies with a number of clearly established printing conventions that have arisen as a direct response to the material processes of mass print. It is separated into distinct sections that are referred to as the 'front matter', 'middle matter' and 'end matter'. These are standard divisions associated with mass-printed texts. Each section contains a different element of the medium. The way the material processes associated with the medium of print works, the 'front matter' and 'end matter' are contingent on the completion of the 'middle matter'. The front matter contains a table of contents or foreword or prologue, publication copyright and date pages and an extra internal title page. It is numbered separately using roman numbers.

The visual uniformity of Vernon's knowledge medium (1965) mediates the idea that the content is likewise rigorously and carefully considered, and together represents a professionally produced product. The author comments on this visual consistency as though it is virtue and something to be aspired to: "The chapters have been organised into a pattern whose structure is

consistently enlarged upon as additional concepts are provided and integrated into the developing picture" (1965, p. iv).

In the preface (the front matter) the author states, "The presentation of these ideas, however, is in a relatively original form" (p. vi). Vernon does not expand on this or say how the form differs from that of other knowledge media of the period. Indeed, as the above analysis shows, from a 2015 perspective this medium is in a traditional and orthodox format. One possible interpretation is that he is referring to the inclusion of 'interactive' exercises, including questions at the end of each chapter, the list of suggested readings, and further exercises for the student to complete. Perhaps Vernon is also referring to the discussion questions at the beginning of each chapter. These are discussed in Section 5.3.1.

This top-to-bottom, left-to-right, chapter-by-chapter, section-by-section consistency creates the impression that knowledge exists in a series of taxonomies in the form of a branching tree. The intense focus on consistency of hierarchical arrangement of content mediates the sensory impression that the path to coming to know about sociology is straightforward. If the knowledge seeker follows the prescribed path and remembers the content, then mastery is assured. The Vernon (1965) knowledge medium mediates the idea that knowledge is a series of isolated, unambiguous items of information, and that it is possible to arrive at a single correct answer found within a finite body of knowledge. In a pedagogical context where this medium was being used as a formal text, testing a student on knowledge outside the text would be perceived as unfair.

The Vernon (1965) knowledge medium was produced with a clearly defined market in mind — teachers and curriculum leaders of students who were required to answer the standard, first-year curriculum question: 'What is sociology?' In responding to this question knowledge seekers were expected to confine their knowledge seeking to this preselected medium. Students were socialised to have confidence that coming to know about the field of introductory sociology was a process of following the carefully constructed, highly symmetrical path that was laid out in the medium.

The highly structured form in the Vernon knowledge medium mediated the idea that it was pedagogically appropriate for the learner to move through a prescribed sequence to come to know in terms of pre-established taxonomies. Although knowledge seekers were able to open the medium and randomly dip into it, this random dipping in was neither actively encouraged,

nor acknowledged as a legitimate way of engaging with the text. Any deviation from the pre-developed route was perceived as taking a shortcut or as engaging in learning in a superficial way —in other words, as covert knowledge-seeking behaviour.

One of the outcomes of using highly structured visual taxonomies to represent knowledge is that empathetic and intuitive ways of knowing or emotional engagement with others cannot be easily represented or assessed. This has the effect of excluding some knowledge, and mediating strict parameters around what is perceived to be appropriate knowledge in terms of achieving mastery. The fact that the 'gate' to the content in the Vernon textbook is tightly controlled was never brought to the knowledge seeker's attention. For example, the knowledge seeker was not given the opportunity to consider or comment on the author's and contributors' ethical or religious affiliations. This point is further developed in Section 5.4.1.

An implicit aspect of this carefully structured composition was that, in order to achieve a degree of visual consistency, the content had to be expanded or constrained almost regardless of the breadth of field each section was covering. No rationale was given as to how decisions were made about what to include or exclude and any decisions that were made about reducing or expanding the content to fit the Vernon medium were not made visible to the knowledge seeker.

While there are some images in the Vernon knowledge medium, no attempt was made to integrate them into the text. This is a material response to the production processes of the time that required images and text to be handled through quite different methods. Images were inserted subsequent to the production of the text and were generally sourced from the commercial stocks of limited, often old, images available to authors and publishers at the time. The epistemological implications of this will be further discussed in Section 5.3.1.

The material composition of the knowledge medium limited the extent of engagement between the others (including the author, peers, teachers and others interested in the topic) who were mutually engaging with the medium. The primary engagement was between the knowledge seeker and the knowledge medium. This mediated the impression that it was possible to examine complex phenomena (in this case the field of sociology) in a decontextualised way confined within the covers of the book. Coming to know using the Vernon knowledge medium was predominantly a process of intellectually engaging with abstract, analytical structures

within the confines of a self-contained and stand-alone mass-printed textbook. In this knowledge environment reading (knowledge seeking) was an isolating activity.

The carefully justified margins mediated the impression that the sociological issues addressed in the Vernon knowledge medium existed as standalone facts that were not contingent on the surrounding social context. The simplistic and highly generalised approach to knowledge is exemplified with the only reference to New Zealand being a photograph of a young Maori woman (p. 62)—highly likely to be a serendipitous image purchase from a commercial image library (or the publisher's archives).

No records remain to explain why the Vernon (1965) knowledge medium was specifically selected by the course supervisor or teacher over other options, or whether it was a 'prescribed' or 'required' text. As described in Section 3.3, the decisions about who was entitled to select a specific medium and what the selection criteria were are complex, and rarely discussed or revealed to the students who use the medium. Also as discussed in Section 3.3 the processes associated with choosing one medium over another vary considerably from country to country.

Many of the pedagogical conventions associated with the way that mass-printed knowledge media are used in the classroom (for example, the conventions around required or supplementary texts) are a result of the resourcing constraints associated with the production and distribution cycles associated with the medium of mass print. At the time that the Vernon (1965) knowledge medium was published it was considered pedagogically appropriate for teachers to confine students' knowledge-seeking activities to a prescribed medium. This single medium could be supplemented with other recommended readings (such as those listed in the Vernon medium), but these peripheral knowledge media were carefully chosen and monitored by the teacher or the institution and frequently accompanied with a number of provisos—for example, they must be academic, must not be associated with sales and promotion, and must not be too old (Valverde, Bianchi, Wolfe, Schmidt & Houang (2002). These arbitrary printing conventions came to exert considerable influence over what was considered to be relevant and irrelevant knowledge about the field of sociology.

The Vernon (1965) knowledge medium has no capacity for remediation. Fifty years after the medium was published the rhetorical intentions of the author are still clearly visible exactly in their original form.

As another example of how the composition mediated the idea that knowledge was stable was that, in order to justify the considerable expense and significant resources required to produce each print run and, in order to maximise the number of sales, the content in the Vernon (1965) knowledge medium was produced with a view to appealing to the widest possible market for the longest possible time. In other words the author needed to anticipate and deal with all possible objections before they arose Ong (2012). No records remain about the size of the print run associated with the Vernon (1965) knowledge medium but it is reasonable to assume that thousands of identical impressions were printed and distributed. In order to appeal to a wide audience for an extended duration of time Vernon (1965) was required to anticipate the objections of the audience and include content that was highly generalised and sanitised, where as many tensions as possible had been eliminated prior to production.

In summary, from a modal perspective, the Vernon (1965) knowledge medium is highly spatially confined and consistent. A great deal of time has been spent carefully crafting the content to achieve visual consistency. This consistency mediates the impression that knowledge exists in a series of taxonomies. In this sensory environment reading (knowledge seeking) was an isolating activity—coming to know using the Vernon knowledge medium is predominantly a process of intellectual engagement with abstract, analytical structures. There are minimal modes that mediate a sense of the wider range of participants who have been engaged in the development of the content: the primary engagement is between the knowledge seeker and the knowledge medium. The behind-the-scenes disputes and reworkings have been removed and the medium has no capacity for remediation. This mediates the impression that what is known about sociology is a stable field of knowledge and that it is possible to examine complex phenomena (in this case the field of sociology) in a decontextualised way within the confines of a self-contained and stand-alone mass-printed medium.

5.4.2   Space and the 2010 knowledge medium

The material composition of the Carl (2010) pedagogical knowledge medium is highly modally diverse. A wide array of modal elements such as graphs, overlapping frames, variations in font sizes, stand-out boxes, white space and four-colour images are used creatively on almost every page. The body text, title display, and other textual elements consist of a wide range of sans-serif and serif fonts of varying sizes and colours. The producers of this medium have gone to

extraordinary lengths to maximise the use of a range of design elements. Until the affordances of desktop publishing made the incorporation of image possible, the dominance of image over word was a feature of knowledge media designed for young children (Jewitt, 2005). The intention on the part of the publishers is to mediate the sense that sociology is a fun and engaging topic.

This shift in presentation style from Vernon (1965) to Carl (2010) reflects the dramatic changes in printing technology that took place between the two publications. The affordances of desktop publishing and just-in-time print runs meant that attention could be paid to producing a product with a high level of rhetorical impact.

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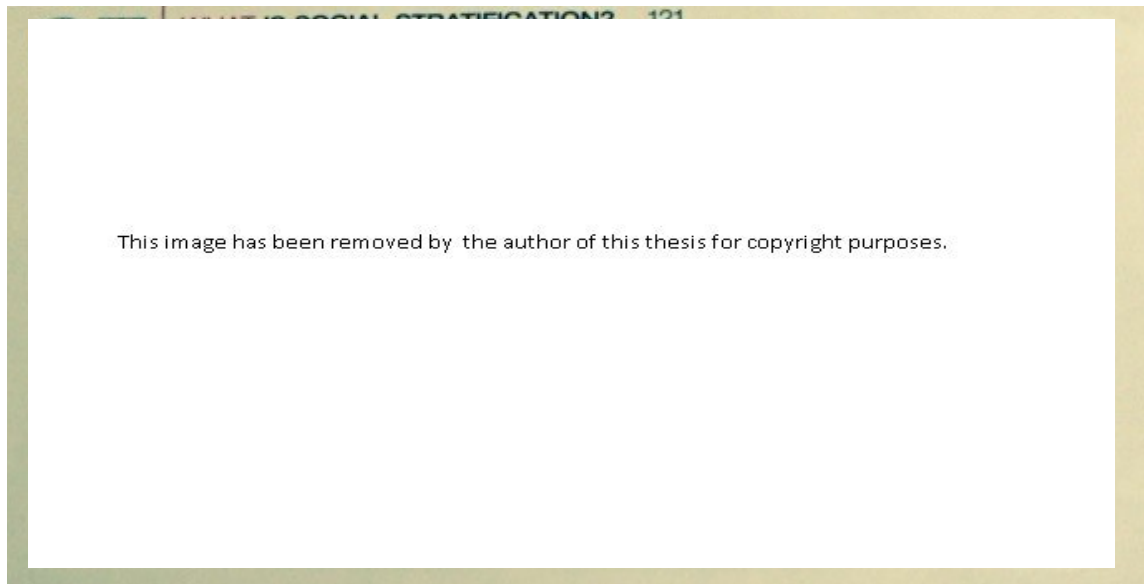
Figure 7 Contents page for Chapter 8 (Carl, 2010, p. 148)

There is considerable consistency in style throughout the Carl medium. For example, on the cover there are a number of elements such as chapter and section titles that are consistently in red font, or a white font on a red background. However, any uniformity is outweighed by the quest for 'special effects' arising from significant variations in font types, sizes and colours. The flow of meaning in the Carl (2010) knowledge medium is not as structured or sequential as in Vernon (1965). The content is no longer divided into specific sections such as front matter, body and back matter; instead the various elements such as the publisher's information and the

contents page are more integrated. The only section that is materially inconsistent with the rest of the medium is the three-page pull-out study card that is folded into the back section.

The magazine-style format encourages the knowledge seeker to browse or flick from topic to topic, dip into the medium in a more casual manner, and navigate his or her own pathway through the medium rather than have connections specifically spelt out. There is no longer a single flow of attention with a prescribed reading path, but rather competing visual elements laid out in complex, even chaotic, arrangements. Although the Carl (2010) knowledge medium uses numerous frames, the frames are neither clearly defined nor obtrusive.

The sense of moving through the entire text in a sequential fashion is reduced in this medium. The cover of the medium acts as a summarised contents page. The key topic headlines are arranged around the central photograph. Each topic headline is accompanied with an associated page number to allow the reader to navigate directly to that point in the text. There are prominent taglines about content topics, such as "Me and my peeps" and direct questions, such as "Are you part of the tweets revolution? Find out how social media can change everything (p. 219)".

One of the key navigational elements of the Carl (2010) medium is the side index. The medium is organised so that the main subject or chapter heading is itemised for each section down the side of the page. The recto side is organised by chapter and the verso side by subject theme, with the exception of the title pages. The page numbers and chapter titles are horizontally positioned on this side index rather than on the bottom right (as in the Vernon knowledge medium). They are positioned to enable the reader to flick through the pages with their thumb in order to go straight to the appropriate section rather than progressing sequentially through the medium.

Another locating device is the contents page's inclusion of a miniature image of the relevant section title page (see Figure 7). When the reader turns to the specified page this miniaturised image expands. This gives the perception of 'zooming in' to the content, in reference to the equivalent experience mediated by the screen.

The elements on the pages of Carl (2010) overlap in a somewhat haphazard fashion and connections between them are not explicit. For example, in the entire first chapter there are only three lexico-grammatical references that specifically establish the connection among the

various elements. Elements such as images and text boxes visually interrupt the flow of the reader's attention. Images, graphs and standout boxes are frequently placed in the middle gutter, margin sizes are often inconsistent and brightly coloured folios and reference titles appear comparatively randomly in type and placement.

However, there are still vestiges of uniformity of presentation style harking back to Vernon (1965). The length of the chapters are still consistent and some design elements are repeated throughout, such as the 'connected dot' border that outlines each chapter title page with an opposing image on the verso page.

Like Vernon too, the titles and headings in the Carl (2010) medium summarise the content that follows. However, the format used is a magazine-style headline—for example, "From Classroom to Community: Teaching in a Migrant Community" (p. 187) and "United States: Number One with a Bullet" (p. 231).

The images and the content are integrated to a much greater extent than with Vernon. The images are fitted within the external margins and in a wrap-around text format which closely hugs the shapes of the images. This fusion of image, graphics and print has significant epistemological implications. Whereas the Vernon medium mediates the impression that the field of sociology can be perceived as a complete 'body' of knowledge, the Carl (1965)
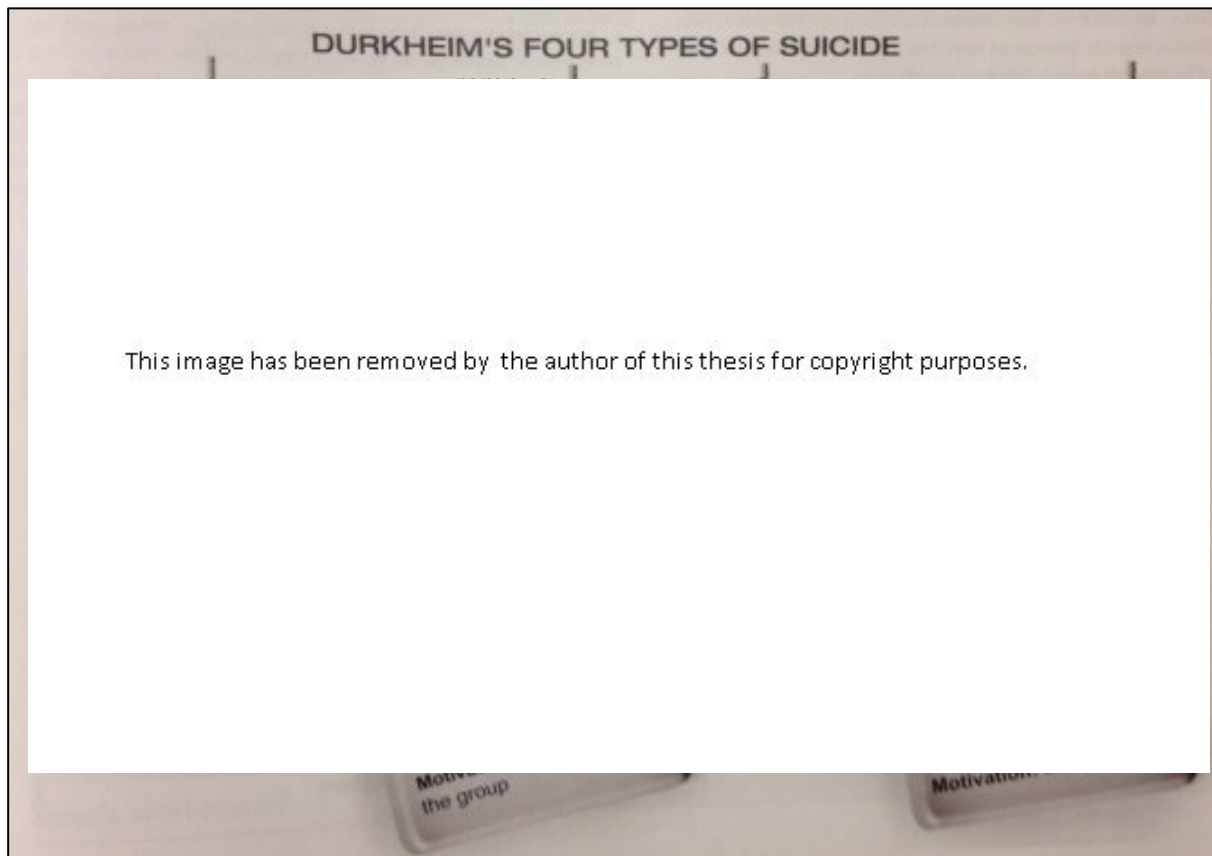

Figure 8 An illustration of Durkheim's Four Types of Suicide (Carl, 2010, p.7)

medium invites the reader to engage in the content in a much more haphazard and intuitive way.

At the end of every chapter there are sample questions and suggested topics for further study, and there is an online 'test bank' that accompanies every textbook. This 'test bank' contains numerous references to online adjuncts to knowledge: a number of the pages contain references to other sites, prompting the reader to go elsewhere for information. For example, "If you need a quick style guide, be sure to visit their Web site at http://www.asanet.org" (Carl, 2010, p.39) and other online adjuncts such as http://www.thethinkspot.com. This has the effect of positioning the knowledge medium as a portal or gateway through which other relevant knowledge can be accessed rather than as a self-contained standalone medium.

It is clear that the designers of Carl (2010) set out to package knowledge in a form that was alluring to young consumers and their teachers through a contemporary incorporation of four-colour illustrations and photographs; a bewildering array of fonts and type sizes and colours; and an extremely varied and complex typography consisting of numerous overlapping frames, flow-charts, tables, graphs, symbols and stand-out boxes.

The effort that the publishers have gone to in order to integrate text and image, and to express ideas in spatial and diagrammatic terms in Figure 8 is remarkable. Figure 8 has been specifically developed to illustrate Durkheim's four types of suicide. A close examination shows that the image has been carefully tailored to support the theoretical points that are being made. The theoretical 'story' of the four types of suicide—egoistic, altruistic, fatalistic and anomic—are each cleverly expressed through the visual image that is included.

Another example is Figure 9. In this image the graphic designers who were commissioned to design the graphics for this medium have gone to extensive lengths to provide a visual representation of Wallerstein's theory that the world can be divided by its connection to economic power. This is an attractive, highly colourful image that has attempted to condense a complex theory into a 'snapshot'. The more subtle questions of what sensory messages this image actually mediates are of no particular concern for the designers of this medium. They appear to have no particular interest in the visual literacy of the knowledge seekers using the medium. Their primary concern is to provide alluring 'fill' in order to make the medium more commercially attractive.

This incorporation of an extreme array of modal elements into the knowledge medium has parallels to the original Ramist knowledge media. Ong (2012) described Ramism as going a little bit 'berserk' with the extreme incorporation of spatial representation into the first textbooks by incorporating diagrams and highly elaborate displays. It could be similarly argued that the publishers of this Carl (2010) have gone a little bit berserk with their extreme inclusion of multimodal features, which could be perceived as 'bling' and an over-enthusiastic affordance of the features of desktop publishing rather than contributing greatly to the meaning. In fact, as Figure 10 shows, there is a high likelihood that the image is not only superfluous to meaning but that it mediates an entirely different meaning from the one that the

This image has been removed by the author of this thesis for copyright purposes.
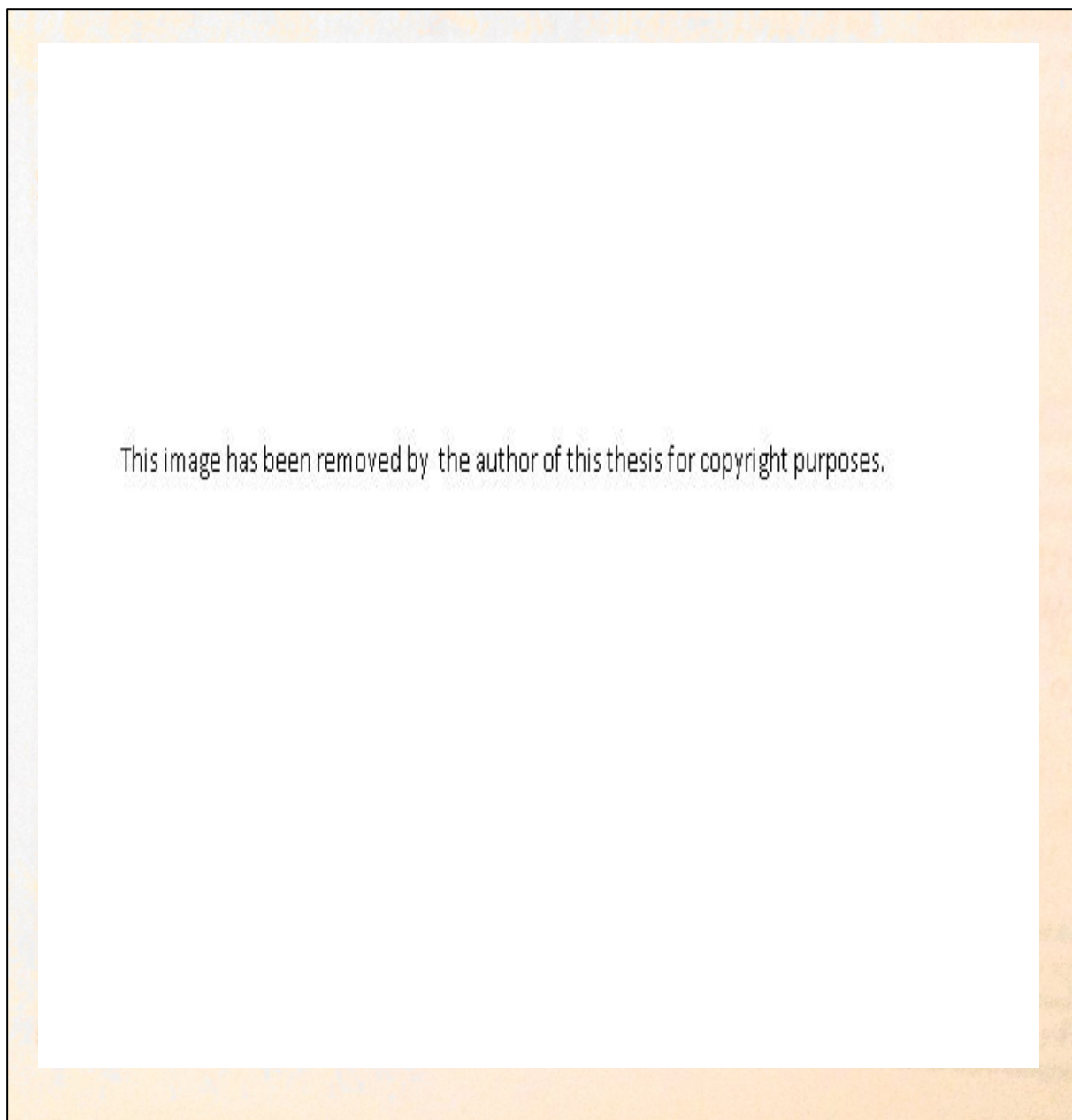
Figure 9 Wallerstein's World Systems Theory (Carl, 2010, p. 146)

publisher intended. The image shows two masked drug offenders side by side. The intended message is that there is a much higher percentage of drug dealers in the US compared with the Netherlands.

A great deal of design effort has been put into creating a one-off image to portray this idea. All of the emphasis has been on the more glitzy elements of presentation such as layout and colour, and little attention has been paid to the possible interpretations of this image on the part of the learner. From this perspective there are two problems with this image. The first is that the proportional difference in the size of the two figures does not relate to the degree of difference in the percentages therefore it is perceptually misleading. Even more disturbing is that, at a casual glance, there is every chance that the image mediates the entirely unintended message that drug dealers are black.

Not only does the ease of digital production processes allow increased incorporation of a wider range of graphic elements in the Carl (2010) medium as opposed to the Vernon (1965) medium, but (as discussed in Section 3.3) the affordances of desktop publishing and the increasingly digitised knowledge medium also make it easier for Pearson Education to promote ThinkSpot ™. I was unable to find any remaining promotional materials related to the Vernon (1965) knowledge medium, and this lack of recorded promotional material may indicate that there was very little promotional material.

This image has been removed by the author of this thesis for copyright purposes.
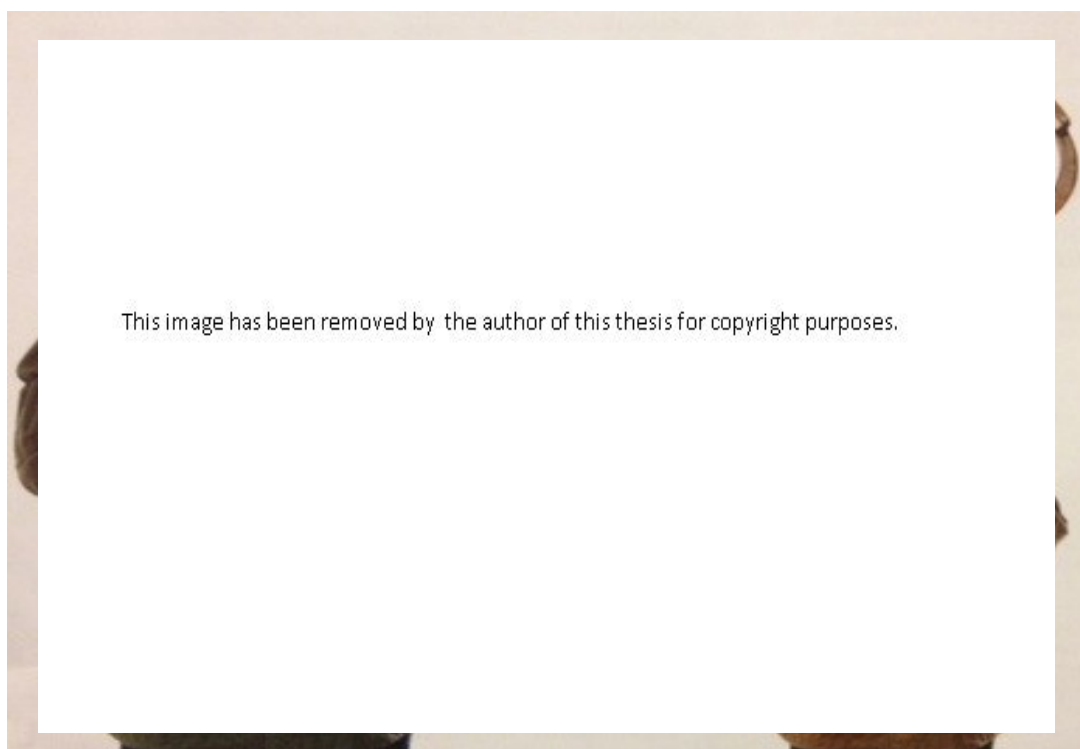
Figure 10 An illustration of drug offenses per 100,000.00 people (Carl, 2010, p. 34)

Online Pearson Education makes a number of unsubstantiated claims about the pedagogical affordances of the Carl (2010) knowledge medium. For example the medium is promoted extensively on third party Internet based retailer Amazon.com but these claims are uncited.

> With an engaging visual design, 15 page chapters, and readings from popular trade titles, THINK Sociology is the introductory Sociology text your students will read. THINK Sociology is informed with the latest research and the most contemporary examples, allowing you to bring current events directly into your classroom with little additional work. The groundbreaking instructor supplements package will help you bring the core concepts of Sociology to life, without burdening your students with heavy, too dense and too expensive learning solutions. Thinkspot, the text's open access website, provides students with a large resource of tools to help them achieve a better grade. (Amazon.com, 2015)

The Pearson Education website claims that the format of the book is learner-centred and that it has been developed in response to what the readers want: "With ThinkSpot, you can study how you want. Whether you like to study online, or print out materials to take with you, we've got you covered" (Pearson Education, 2015). Other promotional claims are made including the claim that the medium has a high degree of "page-fidelity and reflowable content" (Pearson, Education, 2015), "adaptable learning paths" and "downloadable audio chapters, chapter-by-chapter quizzes, portable chapter-by-chapter study cards, key term flashcards" and "more visuals, currency, relevancy, specificity and external source flexibility" (Pearson Education, 2014).

According to Pearson Education these claims are based on detailed studies located in college settings including class observations, ethnographic research, national surveys and focus groups as a basis for the content (Pearson Education, 2015). Not only are these claims uncited but also they use highly promotional language. A feature of these claims is that they refer primarily to the material affordances of the medium rather than the content.

In the case of the Carl (2010) knowledge medium the content has the potential to be remediated into a range of other formats such as printed flash cards, PDF files and audio files, or downloaded onto an iPad, iPhone or e-reader. The accompanying online component appears to be a replica of the print version, but it frequently incorporates a wider range of modes of representation such as sound and moving image, and links to discussion forums and online

resources. This option of remediation into an array of formats is an explicit marketing strategy of Pearson Education that began in the mid-1990s in the form of digital content in CDs that were inserted into the back of books. Pearson Education promote remediation as one of the affordances of the Carl (2010) knowledge medium. They claim that one of the pedagogical advantages of the medium is that it provides a flexibility of material form including "…extra downloads, supplements, end of chapter study material, pull-out laminated study guides, current examples and research, and the flexibility to bring in outside examples" (Amazon, 2015). While Pearson Education make these claims of flexibility, the primary medium is paper-based therefore the potential for remediation in this product is, in practice, limited and possible only within rigid constraints. The knowledge seeker is required to purchase extra access codes for the digital version of the medium. This makes it clear that the publisher has retained considerable control over the appearance of the medium: the online, screen-based version is an almost exact replica of the printed version.

This emerging ability to choose a particular knowledge pathway from a range of options has what Levinson (1997) describes as a self-corrective quality. He claims that this allows knowledge seekers to conduct their own processes of triangulation. This ability to 'double check' subtly mediates a number of implicit messages: confidence in the readers' right and ability to cope with tension between different perspectives and even to embrace dilemmas; greater acceptance that learning involves readers constructing their own meanings; and trust that the readers are competent to make their own choices (Mules, 2003). This is further discussed in the following section in relation to the Wikibook knowledge medium.

Another example of the way the material constraints of mass print have influenced the sensory experience of knowledge is that the material composition of each of the three knowledge media has influenced what was given significance and what was excluded, including forms of knowledge that were easily represented in two-dimensional, highly systemised formats. This implicitly positioned other kinds of experience, and other forms of knowledge, as less valid. In the Vernon (1965) and, to a lesser extent, the Carl (2010) knowledge medium, the drawn-out, resource intensive processes associated with extensively massaging and filtering the content prior to publication gave the impression that what was included was significant. This gave the content a degree of authority that was often related as much to material affordances and constraints as decisions about what was considered to be the most relevant content (Mules, 2011).

In summary, the modal architecture of The Carl (2010) knowledge medium is more complex than the Vernon (1965) medium. This is directly related to the affordances of desktop publishing. The fonts and punctuation are very varied and expressive. While the weight is similar to the Vernon medium the flexible pages mediate an impression of disposability. The more casually arranged order of content and increased use of hyperlinks is mediating a sense of less explicit messages, of fragmenting and loosening the flow of attention, and of stimulating exploratory interest in the problems posed rather than finding simplistic explanations and 'the right answer'. The numerous references to external links broaden the extent to which engagement with the outside world is legitimised. No longer does the medium claim to present facts to the same extent, and the presentation style is less didactic. These modal features are increasingly mediating the sensory experience that knowledge is complex and personal rather than a series of standalone facts to be mastered.

5.4.3   Space and the Wikibook knowledge medium

As stated in Section 5.0, the *Introduction to Sociology* Wikipedia knowledge medium is entirely digital in its composition. Like the two previous comparators, there is considerable visual consistency across all of the Wikibook pages. On each page the body font and title display font is Times Roman, and the font size of the titles, subtitles and section titles are consistently graduated. Most titles are flush left, although the upper layer of titles is vertically centred on the screen. Variations in colour are limited to a white background, black fonts and blue hyperlinks.

As the following analysis will show there is limited use of images and most of the images are black and white. The content is separated into chapters, with a maximum of three sections per chapter. The main navigation bar is on the upper left of each page. A navigation bar related to the content, or upper level, is on the upper right, with a more detailed navigation pane down the left-hand side. In this medium the figures, footnotes and references are mostly hyperlinks.

Although the *Introduction to Sociology* Wikibook appears to be to be laid out using visual and spatial modes as shown in the two previous examples of knowledge media (such as bullet-points, indents, margins, white space, headings and subheadings), the sensory experience of engaging with the sociology Wikibook is quite different. The experience of knowledge and knowing is more spatial and unstable because the medium consists of a number of interconnected layers that are accessed by hyperlinks. These layers are expressed in text but

they take the reader to sensorially diverse and dispersed places—places outside the boundaries of the Wikipedia medium. For example, the reader can access recorded lectures, interviews with theorists (including more detailed accounts of theories and opposing ideas), films, documentaries and digitised versions of primary documents.

An example of the dispersed sense of choices and directions in the Wikipedia medium is the standard hyperlinked banner down the left-hand side of each page. In the sociology Wikibook medium this banner gives a range of hyperlinked options such as 'Main Page', 'Help', 'Browse wiki', 'Cookbook', 'Wikijunior', 'Featured books', 'Recent changes', 'Donations', 'Random book' and 'Using Wikibooks'. It also includes hyperlinks to specific features and groups such as 'Community', 'Tools', 'In other languages', 'Sister projects' and 'Print/export'. The *Introduction to Sociology* Wikibook can be accessed by various hyperlinked pathways from the main page as well as from pages on other Wikimedia projects, through most search engines, and any other place that provides the hyperlinks to any of its pages. The hyperlinked, layered, composition of the wiki medium creates a sense that the content of the medium is interconnected and dispersed.

These hyperlinks afford many-to-many interactions, allowing those engaging in the knowledge medium, whether actively contributing to knowledge creation or simply accessing the knowledge, to easily flit from section to section and layer to layer. As a result the composition (and consequently the content) of the Wikipedia medium is less concrete. The publishing conventions associated with mass-printed pedagogical knowledge media, such as clear distinctions between the front matter, end matter and the content, have disappeared.

In the Wikipedia medium it is not assumed that there is a firmly pre-developed, legitimised knowledge path, and there is less reliance on a concept of a start and finish. Instead of being expected to proceed through the text in a sequential fashion, users of the Wikibook sociology textbook have the capacity to create their own path depending on the hyperlink sequence they choose to follow. Students using mass-printed knowledge media have been able to skip from section to section and teachers have plucked out certain chapters from texts for emphasis—but this random movement has been a covert activity. In the Wikipedia medium, this more haphazard, serendipitous way of moving is increasingly acceptable and the new norm. Not only is there a range of paths or routes within the medium but the Wikibook medium itself can be accessed in a number of ways, including via search engines, searches within the Wikibooks, 'Books by subject' section or via links from other Wikibook or web pages.

Even for those participants who are using the medium solely as readers, and are not participating in creating knowledge, the act of browsing online is less directed. Knowledge seeking is increasingly occurring outside the confines of a single, certified medium. In the Wikibook knowledge environment the teacher's ability to control which knowledge sources the student engages with is reduced. Following the various links from the sociology textbook page leads to an array of choices all presented as having equal epistemological status, and all jumbled together with no pre-established decisions about relevance and information quality. The knowledge seeker has the ability to choose from the various links or options in an undifferentiated way, and is increasingly entitled to rummage around and choose from a greater range of knowledge options such as video clips, recorded or transcribed interviews, author home pages, Facebook pages, blogs, PowerPoint™ presentations and scholarly journals.

There are references and links to a range of knowledge media outside the Wikibook medium. For example, on 19:22, 19 June, 2008, Piotrus wrote:

FRONTLINE seems to have a good selection of free, full length online documentaries Media Education Foundation has a good list of documentaries. They [sic] videos themselves are not free, but there are sometimes additional resources (study guides, trailers, etc.)

At 18:56 on 8 November 2008 Piotrus added to this contribution:

Another thought: I've learned about existence of expensive sociological videos (often between $100-$300). I don't know who has funds to buy them - and I don't think they are useful to be listed here, if the only way to obtain them is to pay such a horrendous price... --

Another sensory difference for those engaged in the Wikipedia knowledge environment is that knowledge seeking is increasingly occurring outside the classroom and outside the formal institutions of schools and the certified curriculum. This pedagogical knowledge medium is no longer confined to a specified location. Knowledge seekers are engaging with physically dispersed others from the confines of their own homes, or from alternative more diverse environments. For example, an analysis of the contributors to the *Introduction to Sociology* Wikibook based on their user pages shows that their contributions are occurring across a range of diverse locations including South Dakota, Pennsylvania, Canada, California, London and Germany.

Unlike the previous two examples of knowledge media, the reader has no sensory perception of the scale of Wikipedia. In the Wikipedia knowledge medium topics within the field of sociology, whether big or small, are not allocated status according to their size—they are not expanded or restricted to fit the confines of the medium. One of the key material differences between the Wikibook and the previous two examples of knowledge media is that the former is not constrained by size. Mass print publications such as Vernon (1965) and Carl (2010) are limited by the constraints associated with the material dimensions of the printing press. The wiki knowledge medium consisted of over 40 'pages' on 15 June, 2014, however it has the potential to be as big as necessary to include all relevant content as there are none of the constraints on size associated with printed media. Also the Wikibook site states that it is a collection of open-content textbooks that can be used in a traditional classroom, an accredited or respected institution, a home-school environment, as part of a Wikiversity course or for solo learning.

The modal format of the wiki-based knowledge medium is highly unstable. In terms of its material composition, the *Introduction to Sociology* Wikibook has the potential to be altered and revised almost instantaneously by feedback, comments or editing. Every 'Book' page has a corresponding 'Discussion', or 'Talk, page, which is where contributors discuss both the content and form of the knowledge medium, for example to explain or propose changes to the 'Book' page. This includes discussion about the structure and aesthetic layout of the Wikibook.

Whereas the Vernon (1965) knowledge medium and the Carl (2010) knowledge medium are both paper-based, and therefore cannot easily change their form, the Wikipedia knowledge medium can be readily remediated into a range of other formats. The Wikibook knowledge medium can be remediated over a number of devices including a tablet, phone, i-Pad, voice synthesiser or printout. The *Introduction to Sociology* Wikibook can also be purchased in book version via Amazon.com. In addition, the visual appearance of the wiki knowledge medium can easily be altered by changing personal preferences such as the font type and size, depending on the affordances of the particular device through which the content is being mediated. It is instantly available in a wide range of languages, including a wide range of languages. In this way, the content on the Wikipedia site is in a constant process of change as it is capable of being remediated by the receiver.

This ease of remediation crucially alters the knowledge medium's unique modal capacity for rhetorical presentation of the content because it reduces the producer's ability to control the

artefact's appearance at the point of reception. For example, while some residual conventions such as upper case and lower case can be guaranteed to be accurately conveyed from sender to receiver, modal features such as layout, margin size, font and colour are all dependent on the particular specifications of the receiver's screen. If, as is increasingly the case, the recipient's screen is an i-Pad or iPhone, the appearance of the reconstituted text will be quite different from the original. This process of remediation has a number of unforeseen consequences. For example, from a modal perspective, small keypads on mobile phones have the effect of limiting the number of characters that can be used to form a message and this mediates a reduced level of formality.

The wiki knowledge medium makes clear statements about the affordances and constraints of its material composition. For example, it makes a clear statement that it is not paper—therefore it has no size limits, and therefore the style and length of writing that is appropriate for paper may not be appropriate in the wiki medium. It also clarifies the point that it is not a free wiki host or web-space provider. Nor is it a place for propaganda or advocacy of any kind. It is not a vehicle to make personal opinions become part of human knowledge, nor a place for advertising or self-promotion. It does not allow original fiction or literature, it is not a place to publish primary research, it is not an in-depth encyclopaedia on a specific topic, and nor are pages encyclopaedia-formatted articles. It is not a news service, not a dictionary, not a thesaurus and not a place for video game strategy guides. No such statements of transparency of inclusion and exclusion appeared in the two examples of mass-printed knowledge media. Certainly the student is not made aware of any such exclusions.

Wikibooks makes a clear statement about its ethical position in terms of cutting down or sanitising content for children: "Wikibooks is not censored for the 'protection of minors' (content-rated). First, anyone can edit a module and the results are displayed instantaneously, so we cannot guarantee that a child will see or read nothing their parents may find objectionable. Second, Wikibooks has no organised system for the removal of material that might be thought likely to harm minors. However, modules can be, and are, censored by consensus." (Wikipedia, 2015)

Another example of the reduced emphasis on rhetorical control of the Wikipedia knowledge medium is that one section of the medium can be changed while others can be kept in their original format. Another consequence of the changes in material composition is that there is limited incentive to pay attention to aesthetics and stylistic conventions such as layout, because there is no longer an economic incentive to make the medium attractive. Unlike the Carl (2010) knowledge medium, the Wikipedia knowledge medium is almost entirely text-based. These images are not included in every section but in the more carefully crafted sections. They are included almost haphazardly and are peripheral to the key meaning. None of them are explained or positioned as particularly important. While in the Carl (2010) medium the photographs, graphs and tables provide a structured segue into reading, in the wiki knowledge medium there is no attempt to use the visuals to segue into the text or to spell out the connection between images and text by using captions. The point is that in the wiki knowledge medium the reader is permitted to develop their own meaning rather than being 'messaged'.

Figure 11 A photograph of Emile Durkheim (Introduction to Sociology Wikibook, (accessed March 7, 2015)

There are several busts and photographs of prominent theorists. As shown in Figure 11 these images are generic. Most of them have been accessed through an image repository. Unlike the Carl (2010) medium, in the Wikipedia medium the authors have neither the resources nor the motivation to rhetorically craft the content. This change has led to a devaluing of the role of aesthetics and layout as there is no business model associated with this medium that justifies applying significant resources to making the medium alluring from a marketing perspective. This is significant because, as the literature review in Section 3.3 indicated, teachers' and course leaders' decisions about why one knowledge medium is chosen over another is relatively arbitrary and one of the key influencers is the material composition of

the medium—particularly the extent to which a range of attractive modes such as colour, images and stand-out boxes are included in the format.

One of the affordances of the printing press was that it gave the publishers of mass-printed knowledge media the ability to disseminate marketing material, and elaborate on their particular features. For the first time a medium of communication had the capacity to promote itself (Eisenstein, 2013). This contributed to the perception that it was appropriate for pedagogical publishing companies to use extensive, largely unsubstantiated marketing rhetoric to sell knowledge media. This was discussed in particular reference to the Carl (1965) knowledge medium in the previous section. If there was any printed promotional material related to the Vernon (1965) knowledge medium, it is no longer available. As discussed in the previous section the publishers of the Carl (2010) knowledge medium felt entitled to make a number of unsubstantiated, rhetorical claims about the medium. No such promotional or marketing claims are made on the Wikipedia site.

The breakdown of the predetermined flow of content has significant epistemological implications. The Wikibook medium mediates the perception that knowledge is complex with multiple possible interconnections, as opposed to a sequential tree-like structure. It provides those engaged with the knowledge medium with the ability (and the permission) to make their own decisions about the value of one thing compared with another. For example, one of the tests for plausibility is adjacency (Vygotsky, 1962). This means that coming to know is always, on some level, a process of comparison. In the Wikibook environment knowledge seekers are increasingly engaged in an active process of making their own comparisons as they navigate around the field of sociology, aggregate content and make their own decisions about the most credible sources.

The loss of rhetorical control over the final appearance of the form of knowledge is contributing to a devaluation of the significance of form and aesthetics in the Wikipedia knowledge medium. A number of the design features associated with mass print once taken for granted are breaking down, like careful attention to the conventions of upper and lower-case, dividing text into careful paragraphs, chapters and carefully numbered pages. There is greater opportunity to engage with primary sources and there are numerous links to other, diverse forms of media such as video. It makes numerous references to resources outside the medium. Hayles calls this broader, more expansive vantage point 'distance reading' (Hayles, 2005). This distanced reading allows a stepping back, a greater awareness of the author and the author's

motivations. This is contributing to a stripping away of background details and increasing acceptance of the idea that direct access to the main point unencumbered by rhetorical niceties is preferable. The sorts of claims associated with mass-printed knowledge media are sounding increasingly anachronistic and increasingly lacking authority.

In summary there are numerous modal indications that the sensory experience of epistemological space is expanding in the Wikipedia knowledge medium. These modal indicators show a much more fluid, less rhetorically developed format. The unfolding disputes and reworkings behind the scenes are visible. The level of interest in the careful crafting of the content or issues of formatting are reduced and there is much greater interest in spontaneity and group contributions. Prior to the affordances of digitisation the processes of creating the knowledge medium required extended periods of planning and extensive time was taken to apply explicit and correct conventions of style. From a sensory perspective, this lack of refinement is contributing to an increasing acceptance of rougher, less carefully crafted surfaces and an increased suspicion of certainty and perfection. This is mediating a move away from the highly generalised, consensus-style knowledge associated with mass printing. The content of the medium is seen as existing outside the contextualising influence of space, and has the effect of presenting what is included about the field of sociology as located in the wider world and in a series of unfolding conversations rather than confined to a standalone text.

5.5   Sound: the presence and influence of the other

The third sensory axis that is applied in the following analysis of the three selected examples of knowledge media is sound. Section 5.5 analyses the presence or absence of modes related to sound in the three selected comparators of knowledge media. This is the extent to which they mediate the sensory experience of the voice or presence of the others who are mutually engaged in the knowledge experience. From an epistemological perspective the presence or absence of the sound or voice of the other or others who are mutually engaged in the knowledge experience is a significant element in the attainment of sophisticated beliefs about knowledge. The sensory experience of others or 'otherness' is at the heart of Ong's theorising about oral ways of knowing (Ong, 1977, 2012). Finnegan (2002) considers that the experience of 'otherness' is the central element of human understanding.

Perceptions of the aural component of knowing have a significant influence on beliefs about knowledge, particularly the extent to which knowledge can be perceived as located in texts,

arrived at through a process of deductive reasoning (Schommer, 1990, 1993a, 1993b, latterly Schommer-Aikin, 2012) or located in human interaction. This increased visibility of the background collaborative processes, as seen in the following diachronic analysis is mediating significant change to the extent that the content is collaboratively derived from the contributions of individuals, and therefore is not an accumulation of predetermined facts.

5.5.1   Sound and the 1965 knowledge medium

In the 1960s, the decade in which the Vernon (1965) knowledge medium was printed, most print runs took place every five years (prior to that it was generally less frequent) (Nord et al., 2009). In the case of the Vernon (1965) knowledge medium the initial print run was in 1965 and the second printing was five years later in 1970. This knowledge medium was only reprinted once. This extended duration between print runs was directly related to the technological constraints and lengthy production cycles associated with the material processes of mass printing and had significant unintended epistemological consequences.

The drawn-out production cycles associated with the production and distribution of the Vernon (1965) knowledge medium directly impacted the extent to which the knowledge medium gave authority to the text and limited the reader's 'voice' or ability to contribute meaningfully to the knowledge creation process. The knowledge medium is presented as a fully formed, complete, finished product. In this environment, knowledge seekers were not able to engage with the author (or publisher) or take up any significant form of dialogue. By the time the medium went to print the content was highly polished—any inconsistencies and conflicts had been resolved or removed. The reader is left with no insight into the nuances of content crafting—for example, why one item of content was selected for inclusion and another was excluded.

The material processes related to mass printing the Vernon (1965) knowledge medium directly influenced the extent to which the author's voice is audible. The author's name appears only six times. It is prominently displayed on the bottom left of the cover: "GLENN M. VERNON" and then again on the spine of the book. It appears inside the front cover and several more times within the front matter. (The name of the publishing company (RONALD) is prominently displayed on the bottom of the spine.)

The reader is provided with little information about the background and personal affiliations of the author and what the audience is told is specifically separated from the rest of the knowledge medium and confined to the front matter in a brief statement:

> Glenn M. Vernon, Ph. D, Washington State University is Professor and Head of the Department of Sociology and Anthropology at the University of Maine. He previously taught at Brigham Young University, Central Michigan University, Auburn University, and McMaster University, Canada. In addition to the many articles he has written for leading journals in the field of religion and sociology, he has also authored a textbook on the sociology of religion. (p. i)

This statement provides little insight into the author's personal affiliations, perspectives or motivations. Students and teachers (particularly in New Zealand) using the text would have had no way of knowing that Vernon was a practising Mormon. However, academics in the US may have noted that his mother's middle name is Brigham (a well-known Mormon name) and he had taught at Brigham Young University in Salt Lake City, and interpreted what was meant by reference to his having written for leading journals in the fields of religion and sociology, and authored a textbook on the sociology of religion. Within the content section of the knowledge medium Vernon's religious affiliations are never referred to. The implication is that, at the time that this knowledge medium was in use, this omission was not considered to be of significance, and the author's religious views were not relevant to his authority in the field of sociology.

Within the content section of the Vernon medium there is minimal specific reference to the author. On page 405 in the 'INDEX OF NAMES' his name is listed as one amongst approximately 550 contributing theorists in tiny (approximately 6 point) print. These refer to six citations (expressed as footnotes on each page) of his publications: "Vernon, Glen M., 104, 120, 190, 323, 340, 374" (p. 405). Other than these small acknowledgements, any indications that the content of the knowledge medium is derived from this particular author have been almost entirely removed.

In the content section of the medium the author makes extensive use of the neutral third person 'one' or the first-person, plural personal pronoun 'we'. This positions the author in the role of spokesperson for those who claim authority in the field of sociology. For example, Chapter 5 ("The Biological Foundations of Human Interaction") is 11 pages long. Within this chapter the pronoun 'we' is used 15 times. The personal pronoun 'I' is not included at all in the content section of the medium. Where it does occur it is separated from the content and located in the front matter.

The extended duration between print-runs and editions, and the minimisation of the unique voices of those who crafted the medium have minimised connection to the source of the content. As a result the medium makes extensive use of masculine pronouns to refer to a collective 'everybody'. For example, in Chapter 5 the pronouns 'he', 'his' and 'him' are included approximately 70 times. The generic term 'man' is used 27 times in this chapter. For example, "Man may be aware of certain relationships between his biological makeup and his social behavior" (p. 74), and "Man evaluates his physical characteristics according to standards he has learned through interaction with others: his behavior stems from the associated plans of action" (pp. 74-75). "Man is obviously a biological being… (p. 72). The terms 'women', 'girl' and 'her' are included four times and only in relation to highly specific examples. 'Boy' is mentioned once, but also only in reference to a specific example. This reinforcement of stereotypical gender roles limits the range of voices engaged in the knowledge conversation in the mind of the reader.

The perception that the inclusion of the author's voice (including the voice or presence of all those engaged with the wider theoretical contribution, editing and production processes) in knowledge media was inappropriate was a direct response to the drawn-out production cycles associated with the Vernon (1965) knowledge medium. During this extended period the author lost connection and involvement with the medium, and became positioned as outside and separate from its epistemological claims. A tone of detachment and a position of ideological neutrality became perceived to be appropriate. As a result, as seen in the Vernon medium, there are no personal or anecdotal references in the knowledge medium. This sense of authorial effacement (Barnes & Strate, 1996) positioned the author as existing outside the epistemological claims and came to be perceived as a virtue in a well-written text.

As a result of the highly protracted production cycles at the time of the Vernon knowledge medium the processes involved in providing feedback or influencing the content were complex and, if they occurred at all, took place over an extended period. A great deal of editorial input was required to achieve uniformity of content and manage the often extensive, expensive and complicated exchanging of proofs between authors and editors prior to going to print. Obtaining new content frequently involved getting written permission from other authors.

By the time the Vernon medium had gone to press it would have been through many phases of editorial and technical intervention. However, an analysis of the medium shows that, by the time it reached this stage, any contextualising backstories, behind-the-scenes allegiances and

theoretical skirmishes that were part of the editing and publishing process were no longer apparent. Overall, any acknowledgment that the content of the medium is the work of a team is limited, confined to the front matter and clearly separated from the body of the content. In the preface Robert L. Stewart is thanked for reading parts of the manuscript and making valuable suggestions and the author's students have been thanked for their comments and suggestions. The author does acknowledge that he has had help with typing the manuscript: "Mrs. Judy Smart and Mrs. Mary Lou Hodge spent many hours typing the manuscript and providing secretarial help. Their contributions are acknowledged with thanks" (p. vi).

The content in the Vernon (1965) knowledge medium is more or less decontextualised from the immediate environment. No records remain about specifically how, or to what extent, this knowledge medium was used in the formal teaching of sociology in New Zealand, but it is clear that the author felt no need to explicitly cater for audiences outside North America. Other than the generic photo of a New Zealand Maori 'wahine' (see Figure 12) the content is derived almost entirely from a North American perspective. New Zealand contexts, cultures, business approaches, case studies or ethical and legal frameworks are not reflected anywhere in this knowledge medium.

In the foreword to the Vernon medium, there is a minor acknowledgement of the contributions of fellow theorists in the sociology field: "The text itself is a result of considerable interaction—most of it symbolic. Although some of the ideas presented are original, most have come from the 'common storehouse'" (p. vi). It is unclear what the author means by 'the common storehouse.' Throughout the medium Vernon (1965) acknowledges a number of other theorists but the perspectives of these other theorists, while mentioned, are not particularly integrated into the 'common storehouse.' Although other theorists are formally cited, their theories are presented as peripheral to the central content. All references to other theorists and contributors are in the third person and content that is derived from the other academics is clearly separated into standout boxes. There is no contextualisation of the other theorists who have been included, nor is any reasoning provided as to why each contributor has been chosen for special mention. In claiming that the ideas in the medium are derived from the 'common storehouse' the author presents the content as canonical rather than a result of the ongoing, original thinking of individuals. In doing so he also presents the field of sociology as being uncontentious.

At the beginning of the medium the author says that he is adopting a symbolic interactionist approach. "An effort has been made to use symbolic interactionist theory as an orienting framework into which a body of sociological knowledge is integrated" (p. *v*). He provides no insight into alternative theoretical approaches and he makes no attempt to explain why he chose symbolic interactionism over other sociological paradigms such as functionalism and conflict theory. Rather than an eclectic approach that embraces a range of possibilities, in order to comply with the structuring conventions of the medium he conveys an impression of theoretical unity, and in doing so he effectively shuts down conversation about alternative constructions. In his perceived need to find a unified organising principle for the medium he has effectively privileged one paradigm over another but this is not made clear to students in any way.

Communication between the producers and the consumers of the medium is entirely one-way. The voice of the reader is not audible in the knowledge medium, nor are readers invited to participate in the knowledge creation process. Readers who may have wanted to have any input into the content of the medium would have had to find the publisher's address, write a letter to the publisher, hope it was forwarded to the author or editor, and—provided the suggestion was considered worthwhile and acted upon—wait approximately five years until the next edition of the knowledge medium. While there are some minimal references to readers in the preface (as discussed above), analysis of the content shows that the presence, or voice, of others such as readers and individual contributors is minimal. (In my copy of the Vernon medium, one of its owners had carried out extensive highlighting in Chapter 1. However, other than these markings and the names of the various owners inside the front cover, there are no signs that the readers of this medium had attempted to have input or influence the medium in any way).

There are three 'interactive' elements in the medium, but from a 2015 perspective these look artificial and tokenistic. For example, in Chapter 3 there is an image of an ink blot that the reader is invited to interpret. No attempt has been made to integrate this image into the text (it is situated above two columns and no text has been wrapped around it) indicating that it was an afterthought, added at the latter stages of production. This inkblot has the nondescript title "Figure 3.4" (p. 50), which indicates that it is an afterthought rather than integral to the knowledge experience.

Another attempt at encouraging reader interaction with the knowledge medium is the list of 10 questions at the end of each chapter. The questions vary significantly in complexity and no

attempt is made to explain how these questions could be used. They may be designed for group discussion or individual study but this is not clear. Another interactive element is a question or prompt at the beginning of each chapter. These prompts are separated from the main text and are in an italic font to suggest a more informal, provocative, interactive style. For example, "Many different answers are available to questions about human behavior. How can one know which of these answers are secured and which are not? Even more important, how can one tell when the same individual is speaking as a scientist and when he is not?" (p. 19), and "Given his biological makeup, how do you think man's behavior would differ from what it now is, if he could not respond to symbols or he suddenly could not take symbols into account?" (p. 39). Presumably these questions are included at the beginning of each chapter with the intention of engaging the reader with the content of the chapter. The answers to the questions are loosely addressed in the content of the chapter.

The illustrations and photographs appear to have been rather randomly selected—most are purchased from commercial pictorial archives such as the Worldwide Photos Inc. or the Bettmann Archive, Inc. They are positioned as peripheral to the main meaning, almost as an afterthought to 'lighten' the text. They appear to have been chosen by those involved in the production process rather than the author. There is little attempt to establish the connection between the images and the content. They are archetypal and impersonal, and position the reader as an emotionally detached observer, almost as though looking at exhibits in a museum.

Limited communicative modes were available for expressing knowledge at the time of production of the Vernon (1965) knowledge medium. As a result the content of this medium is mediated almost entirely by text. In the 392 pages of content there is a total of 37 black and white rectangular or square images. For example, the only image in Chapter 1 is a black and white copy of children's games by Peter Breughel the Elder (p. 6) with the generic and decontextualised caption reading: "Figure 1.1 Human interaction takes many forms. People can relate themselves to each other in many different ways, as suggested by the painting Children's Games by Peter Breughel the Elder (The Bettman Archive, Inc.)" (p. 6).

Chapter 2 is entirely devoid of images. Chapter 3 has three illustrations. The first one (p. 40) is a photograph of a woman and a young boy. They are engaged in some form of intense discussion. No attempt is made to contextualise the image or to establish their relationship. The caption reads, "Figure 3.1 Consensus must be obtained if symbols are to be used effectively. Learning how to use spoken symbols in the approved manner is not always easy. (Wide World Photos.)" (p. 40). The other two illustrations are a black and white pencil sketch (or hand-drawn print) of the New York Stock exchange in 1901 and the above mentioned ink blot. These images appear to have only a limited contextual relationship with the content other than through generalised captions, such as: "Gestures are symbols with which man can communicate as shown in this drawing of the New York Stock Exchange in 1901 by S. M. Stone. (The Bettman Archive, Inc.) " (p. 46).

The caption below the image reproduced as Figure 12 reads: "Figure 4.1. Physical interaction, as in this Maori greeting involving nose rubbing, is given meaning by the ones involved. It is the meaning that influences subsequent behavior" (p. 63). What is remarkable about this caption is that it makes no attempt to explain what a 'hongi' (the correct term for 'Maori nose rubbing') does mean to 'the ones involved'. In part this is a response to the material processes associated with mass print. The image has been purchased from a photo library, probably by somebody other than the author as part of a separate production process. The material process of incorporating the image typically occurred at the end of the production cycle and the challenge of finding out more about the meaning of the hongi from a New York office may have been too great. (The image is likely to have been selected for reasons other than to relate to the New Zealand market, given

Figure 4.1   Physical interaction, as in this Maori greeting involving nose rubbing, is given meaning by the ones involved. It is the meaning that influences subsequent behavior. (The Bettmann Archive, Inc.)

Figure 12 A photograph of a Maori 'wahine'
(Vernon, 1965, p. 63)

its relatively small size on an international scale.)

This lack of integration of modes is a consequence of the material processes of print, which in the analogue environment of the1960s strongly separated image from text. The images were inserted as plates as a separate element of the printing process. This process was expensive and mechanically arduous to set up. Therefore the images tended to be few in number, and were often carried meaning that was peripheral rather than central to the textual content.

In summary the modal composition of the Vernon (1965) knowledge medium positioned the act of coming to know as a private, inward, contemplative experience where the primary relationship was between the reader and the text. All the behind the scenes conversational modes that contributed to the formulation of this medium have been removed from the final product. The lack of modes that facilitate the voices of the participants in the knowledge interactions involved in developing this knowledge medium have positioned knowing as an individual activity where the role of the knowledge seeker was to passively absorb a pre-established body of knowledge about (in this case) the field of sociology. This mediated the sensory impression that knowledge was neutral and existed outside the author's own prejudices and values, and that the author's expertise was unassailable. One epistemological consequence was that, for users of this medium, their capacity for critique was not encouraged—the medium does not mediate the idea that the knowledge seeker has the right and the ability to cope with the tensions between different and competing perspectives.

5.5.2   Sound and the 2010 knowledge medium

In the Carl (2010) knowledge medium the presence of the others who are mutually engaged in coming to know is an emerging modal element in the sensory experience of knowledge. The modal composition of this medium positions the reader as a more engaged participant in the knowledge experience but the primary relationship is still between the individual reader and the knowledge medium.

Compared with the Vernon knowledge medium, the sound or voice of the author of the Carl (2010) medium is perceptible in the knowledge medium. In fact, contrary to the Vernon (1965) medium J. Carl is positioned as having a high degree of personal involvement in the knowledge claims. In the front matter he refers to his enthusiasm for the field of sociology and reveals personal information about himself including his sociology-related inspirations and

motivations. He uses the personal pronoun "I" frequently throughout the medium. In the foreword he specifically locates himself in the medium. He states, "This book is truly a labour of love for me" (p. ix).

Not only does Carl (2010) explicitly locate himself in the creation of the knowledge medium but he specifically locates himself in the field of sociology and uses his own perspective and experiences to illustrate his points throughout the medium. He explains that his interest in the field grew from his job experiences after college. These included working in hospitals, schools, churches and prisons. He describes his experience as a student when he was able to store his entire belongings in the boot of his car. He specifically contextualises his perspective: "Before I ever knew anything about sociology, I had a worldview. Being born in the United States to a religious, working class family, my parents' teachings shaped my point of view" (p. 6).

He also reveals elements of his personal history and information about his family and his feelings towards his family. He provides highly emotional, personal acknowledgements: "To the important women in my life, Sara and Caroline. I love you all" (p. vii). He discusses how he first became aware of gender socialisation when he realised that he and his father had never hugged (p. 47), and how he made up his mind to hug his father when next they met. This inclusion of strongly personal elements provides an awareness of the author's personal presence and biases and increases the sense of the text's self-awareness of its knowledge instability and contextualisation.

Not only is the author more 'audible' in the Carl medium than in Vernon (1965), but also the influence of the others who are implicit in the content is much more evident. In his explanation of the three major paradigms of sociology: functionalism, conflict theory and symbolic interactionism (p. 6) he includes direct, current and personal examples to illustrate these three theoretical positions. For example, in his definition of symbolic interactionism he wrote:

> Our actions communicate meaning. For example, if you are having a 'bad day' what does that mean? One student once told me he had a 'bad day' every time it rained. If that is the case, could such a definition of reality influence how you behave towards others on your job or in the classroom? How might his 'bad day' influence the 'days' of others? Interactionists constantly seek to understand how small interactions influence the larger society. (p. 6)

In the Carl (1965) knowledge medium various theories are contextualised and compared to a much greater extent than in the Vernon (1965) knowledge medium. Throughout the medium, frequent references are made to other theorists' research and ideas, with the dates of their

research clearly displayed alongside. Whereas the Vernon knowledge medium derived its content from 'the common storehouse' of knowledge, in the Carl (2010) knowledge medium the content is acknowledged as being an amalgam of the theorising of a number of academics. Carl consistently refers to these contributing academics by their first name. For example, on page 91 he refers to "Kohlberg and Gilligan's theories of moral development" and "Kirstie Farrar and her colleagues…" (p. 95). The affordances of desktop publishing make it possible to include not only an acknowledgment of the contributors, but also, in many cases, their portraits. For example, on page 91 there are images of Lawrence Kohlberg and Carol Gilligan. This has the epistemological effect of personalising and attributing the content to individuals rather than to the 'common storehouse' to a much greater degree that in the Vernon (1965) medium.

In the Carl (2010) medium the modal affordances of desktop publishing mediate a more informal, intimate and direct engagement with the reader. One indication of this is the use of creative, casualised, 'funky' forms of punctuation such as the liberal use of ampersands, ellipses, exclamation marks and question marks on the front cover. These casualised forms of punctuation mediate a more direct appeal to the reader. For example, the title is an invocation that uses an active voice to encourage the reader to "Think Sociology!". The text on the front cover is written entirely in large capitals in order to mediate an impression of immediacy and informal connection with the reader. It contains several rather confronting questions: "Will I really look like that? – Aging and my body" (front cover) and "Does money really make the world go round? Politics and economy in America (p. 280)" (front cover).

The shorter print cycles mediate the possibility of a more direct relationship between the reader and the author. There is a greater sense that the reader can more directly influence the content of the medium. Carl (2010) uses direct and informal language to appeal directly to the audience through extensive use of the pronoun 'you'—for example, "What do you feel when you see the US flag?" (p. 49). He adopts a chatty, interactive tone with the audience, for example, "Remember my student who lost her job?" (p. 11). Each chapter includes a 'discover sociology in action' section that asks the reader a direct question. He claims that he specifically welcomes

direct feedback and ongoing communication with readers, and provides an email address and the URL of his webpage. [2]

The affordances of desktop publishing facilitate greater integration of the images and the text, both in layout and the use of explicit captions. Explanatory captions correspond more directly to the images, are detailed and often embellish the story behind the image. The verso of each chapter title page features a four colour, close-up, full page image of a person or two people in some form of expressive reflection or interpersonal interaction, suggesting some form of unfolding narrative. The pictures are more directly related to the textual content than in the Vernon knowledge medium. For example, on page 169 there is the image of a woman recycling bottles in a bottle bin. The image is embedded in the text, which is closely wrapped around the figure of the woman. The accompanying text is highly personal, related to a particular incident and reads, "All of this caused me to wonder how much wasteful dumping occurs in our country. Doing this Earth Day exercise taught me the importance of caring for the environment. I may not be able to solve global warming but I can do my part by picking up trash as recycling" (p. 169).

Readers are encouraged to emotionally engage with the others in the knowledge medium. The affordances of the production processes of desktop publishing in 2010 meant that images were readily available and could be more specifically tailored to and integrated with the specific theme of the content than in the Vernon knowledge medium. Throughout the medium there are a number of full-page, close-up, evocative, emotion-filled photographs of people's faces. For example, on page 227 there is a full-page, four-colour image of a young man looking sorrowfully through the bars of a prison cell. He is clearly experiencing emotional anguish. This image is not accompanied by a specific caption but the facial expressions closely convey the linkage between the image and the chapter heading: "CRIME AND THE LEGAL SYSTEM" (p. 227).

In summary the modal composition of the Carl (2010) medium is mediating a greater degree of interpersonal connectedness between the knowledge participants than the Vernon (1965) medium. Although the voice of the author predominates, there is a greater sense of emotional engagement with the content on the part of the reader, and the relationship between the reader

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[2] On the 12th of March 2015 I emailed Carl at the address included in this knowledge medium. I asked him whether or not he had had any feedback from his readers. As yet I have not received a response.

and the author is more equal, engaged and intimate. The changes in modal composition are mediating the epistemological perception that the author's knowledge claims are assailable, compared with the Vernon medium, and that the field of sociology is a state of ongoing debate between a number of experts whose opinions are available for critique.

5.5.3   Sound and the wiki knowledge medium

This section analyses the increasing role that the mode of sound (and the absence of sound—as in silence or lack of response) plays in the epistemological affordances of the Wikibook knowledge medium in comparison to the previous two media. Despite the fact that it is mediated almost entirely by text, the *Introduction to Sociology* Wikibook knowledge medium can be perceived as a series of interpersonal interactions that are, in many respects, an unfolding conversation. A key sensory element in this interaction is the increased presence of the other (or others) participating directly in the conversation. The presence of those who are actively participating is a key sensory factor; so too is the presence of those who are not directly participating but instead silently 'listening' and able to interject, interrupt and contribute at any time. They are also situated in the conversation and present from a sensory perspective.

This section examines the extent to which the voice (even as expressed in text) of those engaged in the knowledge transaction can be heard, and to which those engaged in the knowledge experience mutually influence behaviour as they respond, in some way, to the other's presence. When the presence of the other becomes phenomenologically significant in the sensory experience of the knowledge medium, engagement with the medium changes from representational (primarily visual) to interpersonal (increasing incorporation of the aural sense).

In the *Introduction to Sociology* Wikibook knowledge medium the behind-the-scenes discussions related to the development of both the content and the form of the medium have become fully visible—these dimensions were removed from public view in the previous two comparators. Those engaging with this knowledge medium have a tacit understanding that they can participate in the knowledge construction process if they wish, and that the content is, on some level, the result of collaborative processes and has the potential to be revised almost instantaneously by feedback on content or editing. Individual users' contributions are clearly documented, monitored and fully traceable, and there are direct links to their individual user pages (except in the case of unregistered users where their contribution links directly to their IP

address). This visibility of the background collaborative processes, as seen in the following examples, mediates the sensory impression that the content is collaboratively derived from the contributions of individuals rather than being an accumulation of predetermined facts.

There are a number of modal features that afford the flow of dialogic engagement in the *Introduction to Sociology* Wikibook knowledge medium. It is not a given that those engaging in the Wikibook medium will participate in the behind-the-scenes knowledge transactions; most users of the medium engage with it only as readers. Nevertheless, there are numerous perceptual clues that indicate that the opportunity to engage more deeply is available to anyone who wishes to participate in the knowledge conversation.

For example, on the main 'Book' page there are a number of indicators of the potential for dialogic engagement. In June 2014 the main page has six 'Edit' hyperlinks, each of which gives the reader the option to actively collaborate on one of the six listed topics of discussion. As part of this process edits are reviewed and either approved or undone (reverting to a previous version) by other users. For example, at 20:16 on 4 March 2008, user 'Jxn' made the first of four revisions to the main *Introduction to Sociology* Wikibook page. On the accompanying 'Talk' page he explained that his motivation was to provide "a vague outline for a definition of sociology". From then, as counted on 2 May, 2015, 78 users had collaboratively contributed to the process of knowledge construction, comprising 44 registered and 33 unregistered users.

Unlike the previous two comparators, the content of the *Introduction to Sociology* Wikibook is in an ongoing state of development by a visible process of collaboration and consensus between contributors. For example, at 20:32 on 20 July 2005, user 'Lucidish' commented on the main introductory sociology edit page suggesting that the content should include categorisations of "micro, meso, and macro-sociology." 'Lucidish' provided the rationale for this suggestion, explaining that such a system will "give the student an overall idea of the shape of the discipline". At 09:20 on 8 September 2005, user 'Exmoron' agreed that the suggestion is "probably agreeable" but asked for an example of 'Lucidish's' intended changes.

As another example at 04:28 on 16 July, 2006 user 'Rarr' wrote:

I don't think that we should call this book 'comprehensive' and give it the green 100% icon, considering how 25+% of the sections are simple links to Wikipedia. A few sections need

the green and are still marked as empty - I'll take care of that, but I think we need some kind of consensus about where to place the status. Should it be at 50% or 75% complete?

Following this contribution the unregistered user '72.141.21.242' made an editing change at 10: 17 on October 15, 2006 and followed this change with the comment:

I'm pointing this out without fixing anything or making specific suggestions, mainly because I don't have the knowledge to say where this information really ought to be.

User 'Exmoron' contributed on 14:41, 21 January 2007:

One last thing, please don't delete the chapter on Social Psychology. I know it still has duplicate information, but I have also done quite a bit of work on that chapter. If you were to delete it now, I would lose all of that work - even though it is only about 1/10th the way done.

At 04:28, 19 April 2007 user 'Rtcearly' contextualised his contribution:

I can understand that you want to clean up the pages with duplicate content. That makes sense to me. However, the goal of the wikibook project is to eventually turn that content into chapters of the sociology textbook. I made a very active effort on that book starting about a year ago as I was preparing to use it for a class. The chapters that didn't get finished were ones I didn't use for the class last year. I do intend to continue working on that book as I plan to continue using it for classes in the future, but it is not currently a top priority. I probably won't continue work on it for another 6 months or so (except maybe some sporadic additions here or there). So, if you feel like the content of those pages should be deleted in the interim, that's probably okay - but I will eventually just end up recreating them when I start active work on the book again in the future.

Of particular note is the modal resource of silence (and listening) that is appearing as a key element for sense making in a way that was not phenomenologically significant in the previous two examples of knowledge media. Even in the text-based wiki knowledge environment, silence, or lack of response from others, is becoming sensorially detectable. Silence, defined as a lack of sound (Ong, 1977a), is considered to be an auditory mode. A key indication of the

emergence of silence as a communicative mode is the sensory experience of lack of sound. Silence can signify a range of meanings - for example, reluctance, anger, dismissal or acceptance. In other words, the awareness that the other is present but has chosen not to respond is phenomenologically powerful in this medium in a way that it was not in the earlier examples of knowledge media. In the wiki environment the reader cannot avoid reaching his own conclusions about the meaning of the duration of the silence between posts. For example, as previously discussed I emailed the author of the Carl (1965) knowledge medium and did not receive a response. In this case I did not make any particular personal meaning from this. Instead I assumed that considerable time had passed since the book had been published and his email address was no longer valid.

Integrally connected to the mode of silence is the mode of time. In the *Introduction to Sociology* Wikibook temporality is becoming increasingly significant as the interval between posts is unconsciously assigned meaning by other users. This attribution of meaning is based on a human tendency to attribute negative meanings related to the personal disposition of the other person (or people) engaged in the communication rather than considering external factors. In other words, if the others who are mutually engaged in the communication do not respond the tendency is to interpret this as, for example, disapproval of what has been written. For example, on 5 September 2009, at 09: 45 user 'Sanitized' posted on the discussion page for the sociological theory chapter of the *Introduction to Sociology* Wikibook:

I think this article should be split up into several, it's starting to get a bit intimidating.

As yet, there has been no response to user 'Sanitized's' post and no edits have been undertaken to implement the suggestion. Other users viewing this post will unconsciously assign a range of meanings to this lack of response. To some it could signal uncertainty, hesitation or a reluctance to participate; to others it could indicate that the knowledge contribution was not worthy of attention. The important point is that the knowledge seeker inevitably makes meaning of some sort from silence. In contrast to this, in both the Vernon (1965) and the Carl (2010) knowledge media the lack of feedback was not as apparent and therefore was not phenomenologically significant.

The traditional demarcation between the roles of author, editor and reader is breaking down in the Wikipedia knowledge environment. Whereas in traditional knowledge media these roles are assigned, in the Wikipedia environment these roles develop naturally through participation in

engagement and discussion. Behind the scenes there is a group of experienced editors or administrators who are appointed by consensus and who oversee the editing of both the style and content of the Wikibook. These administrators are 'Wikibookians' who have been active over an extended period rather than being specialists in the field of sociology. Their primary credential is that they have been longstanding contributors to the development of the knowledge medium and have demonstrated their commitment. This community of editors follow well-developed, transparent guidelines, and in doing so have gained the trust and respect of the community. As a result of their regular and principled contributions they have earned special privileges such as being able to delete pages and block users for a specified period.

There are no visible distinctions between the contributions of established experts in the field, those of students, and those who are just generally enthusiastic about the topic or about the wiki medium. Anyone who is sufficiently motivated can engage in content creation. (It is important to note that the discussions on the 'Talk' page are generated by those who are genuinely enthusiastic about the field rather than by an external authority.) Not only is specialist expertise not considered to be a prerequisite for inclusion, but the *Introduction to Sociology* Wikibook knowledge medium specifically states that specialist expertise in the field of sociology is not required. In this knowledge environment consensus has more weight than expertise. A number of the participants who are engaged in the Wikibook do not necessarily have any formal qualifications in the field of sociology, or indeed any formal academic qualifications at all. For example, an analysis of the occupations of the contributors to the *Introduction to Sociology* Wikibook shows that they include undergraduates and graduates, a professor, a teacher, a tax advisor, an electrical engineer and a software engineer. What unites them is a shared passion for finding a way to make the knowledge medium as accessible and accurate as possible for others.

A great deal of effort is put into welcoming and enculturating new contributors to the wiki environment as users move from novice to expert (Lave & Wenger, 2002). There are numerous encouragements in the form of prompts, guides and tours to help 'newbies' through this process. For example, at the top of the *Introduction to Sociology* Wikibook page is a banner that welcomes knowledge seekers and encourages them to participate: "Please continue to improve it and thanks for all the great work so far!" As an indication of the significance that the Wikipedia Foundation places on ease of access, encouraging new participants and collaborative processes, it has gone to great lengths to develop a mark-up language that is

specifically designed for ease of use. The Foundation specifically encourages contributors to "be bold" with their contributions:

> Wikis like ours develop faster when everybody helps to fix problems, correct grammar, add facts, make sure wording is accurate, etc. We would like *everyone* to be bold and help make Wikipedia a better encyclopedia. How many times have you read something and thought – *Why aren't these pages* copy edited*?* Wikipedia not only allows you to add, revise, and edit articles: it *wants* you to do it. This does require a certain amount of politeness, but it works. You'll see.

Enculturation into the wiki community is considered to be very important. There is a clear status distinction between those who are registered members of the Wikibooks or wider Wikimedia community and those who make contributions without registering. Contributors are identified as either 'active users' or 'non-active users'. For those who formally register as a Wikibook contributor, their IP addresses are hidden. Users can choose their own permanent username and user page that means that their wiki identity is known to the wiki community, but not exposed to casual Wikibook users or contributors. Those who register have a number of privileges such as editing rights.

Novices are not only welcomed but are encouraged to experiment. The Wikipedia Foundation has established a facility to encourage participation in the form of a 'play' space where users can feel safe in making contributions. This feature, called the 'sandbox', is available to those who have established an account and are moving along the legitimised route towards becoming Wikibookians. When a contributor first registers a link to the sandbox, it becomes visible in the upper-right corner of the screen. The sandbox gives users, particularly new users, a place to practise editing content, building drafts for later publication in the main encyclopaedia, or just formatting with wiki mark-up syntax. Like all Wikipedia features, the sandbox feature was developed by consensus (it is noteworthy that all the historical online discussions relating to the development of the sandbox feature are still visible).

Users are encouraged to make their mistakes in the sandbox. For example at 05: 45 on 3 March, 2010, user 'Derberth' politely admonishes another user for making experimental additions on the main page: "Please stop adding nonsense to Wikibooks. It is considered vandalism. If you would like to experiment, use the sandbox. Thank you."

The wiki knowledge medium positions contributors as members of an active collective workforce. Much of the terminology is associated with participation and collaboration in interactions that appear complex to the outsider. The creation, monitoring and gatekeeping of content is undertaken by contributors (referred to on the site as 'users'), who can elect to delete or retain revisions. There is a constant sense that these interactions are being watched by other Wikipedians.

Over time the Wikipedia group has developed norms related to both interpersonal interaction and the development of content. For example, there is a well-developed set of guidelines for interaction called the 'Rules of Frameworks'. These rules are clearly developed interpersonal guidelines for what is considered to be appropriate behaviour when mutually constructing content for the *Introduction to Sociology*. Similarly, explicit protocols related to editing have been established. For example, it has been agreed that editing must always be neutral and within encyclopaedic norms in order to avoid concealed conflicts of interest and agendas. The rationale behind each contribution or edit must be accompanied by an explanation as to why the edit was considered to be necessary and provide a clear indication of the type of change. In addition, there is an optional tick box that indicates whether or not the edit is minor or significant, an arrangement that operates on a system of personal integrity.

A further example of the collaborative knowledge environment is a 'Watch this page' tick box which, if checked, will alert major contributors to that page when additional content is added or changes are made. The page includes extensive statistical information such as the number of editors and edits, the number of edits per month, and the number of edits carried out by the top 10 percent of editors. If an issue is unresolved and needs to be addressed, a message to this effect is posted as a large banner across the top of the page. These messages may dispute the neutrality of an article, question the factual accuracy of the content or note the need for additional citations for verification. This policy clearly states that it is important to welcome all new members and courtesy is actively encouraged. It stresses "taking responsibility for your edits", supporting a "civil environment", not "harassing other users", not violating copyright or other laws, and not harming the technological infrastructure.

A lot of the online discussion relates to developing and complying with both task and relationship norms. For example, there are ongoing collaborative discussions about a draft proposal that aims to stop user pages from being used as a homepage for any kind of social networking. At 03.30 on 18 September 2009, user '8888' pointed out that rather than places for

socialising with other Wikipedia users "…user pages are provided mainly for project purposes. User pages are more a way of organising and keeping notes about the work you are doing on articles in Wikibooks, and also a way of helping other editors to interact with and understand those with whom they are working." The point is that engagement with this medium is a process of ongoing discussion and a process of consensus.

The conventions of polite interpersonal communication are given high priority in the medium in a way that was not a factor in the previous two examples. The Wikipedia Terms of Use policy endorses behaviour such as engaging in a friendly manner, open sharing and making regular contributions. Overall a respectful tone is noticeable throughout the interpersonal dialogue in the sociology Wikipedia medium. For example, on 24 April 2013, user 'Jomegat' pointed out that the word "phenomena" was misspelt. "Can someone with editing rights please correct that? Thank you." At 19.41 on the same day user 'Rcragun' corrected this spelling error. User 'Jomegat' thanked him for this. At 00:22, 22 January 2006 user 'Kernigh' took a passive position when he stated: "I have now marked Introduction to Sociology/Social psychology with {{tl|wikify}} instead of {{tl|delete}}, and inserted an obligatory credit to Wikipedia. You might want to watch that module, though; someone else might want to delete it. Thank you".

Although communicating in a polite tone is a well adhered to interpersonal norm, contributors do sometimes engage with a high level of emotional intensity. For example, user 'Rcragun' revealed a number of the personal and ethical dilemmas he had faced in the course of his engagement with the *Introduction to Sociology* Wikibook medium. He admitted to his own 'self-serving' motivations. He openly reflected on his own ideological battle and personal struggle, and pointed out that one of his hesitations in engaging in creating a Wikibook knowledge medium in the field of sociology was that he might undermine the social science discipline and other educators' funding. However, he ultimately chose to do so because he saw reducing costs for knowledge seekers as paramount and because he had a vision for future engagement with knowledge media: "Imagine a world in which every single person is given free access to the sum of all human knowledge. That's what we're doing. And we need your help." This high level of interpersonal intensity is part of the sensory experience of knowing for those actively involved in this medium.

Despite the stated aspiration to achieve a friendly, inclusive and polite tone, agonistic feelings and emotions such as irritation, pleasure and enthusiasm do break through in the interaction.

For example, the wiki knowledge medium's Chapter 5 (Gender) includes behind-the-scenes comments from a user who describes the content as "…dripping with the foul idea that homemaking and childrearing is invaluable, worthless, demeaning, etc. I suspect this originates from very male sexist values about what occupations are worthwhile and how we should really judge things. Must we all rate ourselves by how much money we earn? If so, that's really sad" (AlbertCahalan 02:25, 22 October 2005). In another example of agonism, unregistered user '220.236.186.13' commented in the Health and Medicine chapter: "I hate postmodernism, I loathe every sentence of it. Nevertheless since it's so prevalent amongst sociologists a nod in the direction of Foucault's views of medicine might be necessary." This contributor felt free to share his or her personal views on the subject and clearly indicate that personal values had a strong impact on the contribution.

One of the methods of establishing credibility and inclusion in this community is through self-disclosure. The hyperlinked affordances of the wiki knowledge medium are increasingly enabling self-disclosure and an increased degree of contextualisation of contributions by directly linking to the author's background information. As participants reveal themselves and their motivations, all contributions made by individuals (whether registered or unregistered) are logged, and usernames are hyperlinked to user pages so that it is easy to find out more about the contributors and their motivations. It is perceived as increasingly appropriate to have full access to the contributor's personal experiences (or 'backstories') and to be able track down the person or situation that is the source of the story. In fact, knowledge of the backstory is increasingly recognised as a key component of the knowledge experience. For example, the *Introduction to Sociology* Wikibook has one primary author – user 'Ryantcragun' or 'RCRAGUN'. Following the links that are available in the Wikipedia medium reveals considerable contextualising information about this user. For example, he is an associate professor at the University of Tampa in Florida, and has been engaged in a number of academic critiques of the Mormon Church. In the wiki knowledge environment this information is perceived as a legitimate and important contribution because it contributes to understanding of RCRAGUN's motivations for engaging in the creation of the wiki knowledge medium. Unlike the Vernon (19650 and Carl (2010) media, self-disclosure on the part of the contributors is encouraged, and is an indication whether or not the particular user is a 'member of the tribe'.

Another contributor is user 'Timothy J Scriven'. He has no particular experience in the field of sociology but he is passionate about Wikipedia protocols.

I am Timothy J Scriven, I believe wikipedia can be a powerful source for social change by simply producing the unbiased truth. I live in NSW and of 2006 I am completing my HSC. My home is terrigal, a beautiful area. I worry about some of the directions wikipedia has taken in relation to the NPOV policy. I believe the policy should not be used as an excuse to place material's in articles which seems sympathetic to suicide, paedophilia etc. Furthermore I believe that wikipedia should, while keeping the NPOV policy in place in some form, favour current mainstream scientific opinion. While I can understand the rationale behind the NPOV policy I think it often makes for less, not more, encylopediac articles written in the style of "Some expert's believe that this view point is wrong because..." "However it might be noted that..." "Some have argued that..." etc, which while following the letter do not follow the spirit [sic] of the NPOV policy. (User 'QuiteUnusual' 17:46, 17 March 2010). [3]

Activating the hyperlink attached to Timothy J Scriven's edits reveals extensive personal and contextualising information expressed in a colloquial tone. These more personal, often peripheral forms of interpersonal expression would have been considered highly inappropriate in the formalised knowledge interactions associated with mass-printed text. Now this kind of contextualising information is highly appropriate and an important element of the knowledge experience.

Following the active links associated with each author provides significant information about the backgrounds, interests and personal motivations of the users. For example, a number of the edits on the *Introduction to Sociology* Wikibook page are made by the contributor 'QuiteUnusual'. Activating his hyperlinked username reveals highly personalised and quirky information about this contributor. There is an informal photograph of his family with the accompanying caption, "Me and my family. Hi, I'm Neil. My oldest child once said 'Daddy, you're quite unusual', so the name stuck" (Figure 13). Of note is that on this page is a place to list books that Neil has written or contributed to. The only book included in the list is the Wikibook *Castles of England*. The point is that 'QuiteUnusual' does not consider it necessary to make any attempt to establish credibility in the field of sociology. He makes it clear that his primary motivation is enthusiasm for the Wikipedia medium rather than expertise in the field of sociology:

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[3] An NPOV (neutral, unbiased) article is an article that complies with the Wikipedia's neutral point of view policy by presenting fairly, proportionately, and as far as possible without bias all significant views that have been published by reliable sources.

I'm passionately committed to: Saving the environment. The rule of law. Fighting the emotional, sexual, mental and physical abuse of children. Freedom of speech. Preserving human rights and making culpable before international courts those who violate them. The

Figure 13 Family photograph. Homepage. User 'QuiteUnusual'.

importance of internet self-regulation in addition to government regulation. Legal reform so that the legal system better addresses the problem of moral luck. Combating police

corruption. Upholding the importance of analytic skills. Analytic Philosophy (17:46, 16 July 2010).

The level and type of self-disclosure varies greatly from user to user. For example, user 'Boneheadmx RObinH's page consists of a list of books that he considers to be 'The Best Books', user 'Derbeth' claims that he can read and write fluently in three languages, user 'Jomegat' includes the number of children that he has, and user 'Panic2k4' shares many personal elements of his life including aspects of his philosophy, his political views and a highly specific list of his personal 'likes and dislikes'.

While these elements of self-disclosure are encouraged rather than required, it is clear that openly disclosing personal details, even the seemingly trivia as in the examples above, gains inclusion and respect from the Wikipedia community, and has the effect of reducing the power distance between contributors.

The Wikipedia knowledge medium mediates a high degree of personal authorial accountability. Users who are active in the Wikipedia community are very conscious of their online reputations. Many of the contributors to the *Introduction to Sociology* Wikibook have a range of Wikimedia pages, which further establishes their credibility. For example, a number of *Introduction to Sociology* contributors have user pages that link to one or more of their other Wikimedia user pages. Others do not specifically link their pages but remain traceable by their username through a simple online search. For example, user 'SB Johnny' can be located on Wikipedia, Wikiversity and Wikimedia Commons under the same username 'Robert Horning.' On his user page he says: "For the most part, I hang out at Wikibooks. Check out what I'm doing over there". As another example, user 'Spat' has a Wikipedia page that contains additional information to his Wikibooks page including a link to his membership status at the 'WikiProject Universities'.

The Wikipedia community has a well-developed system of awards for a range of contributions such as for those who have made a number of contributions, those who have been particularly helpful to others, and those who have made small incremental edits that might not be particularly noticeable. These awards, which are listed on users' pages, establish the credibility and authority of the user and can be seen as incentives for conforming to the mores of the tribe. An example of this is the user page of 'TheGeneralUser' that reveals that he has received awards for 'Random Acts of Kindness', 'Helping Hand' and 'Good Humor.'

Additionally, Wikipedia rewards high levels of interpersonal and ethical engagement between knowledge participants with a reward system called 'Wikilove'. This system enables users to give awards as part of a 'kindness campaign' in order to promote civility and respect. A 'Thank' link is included on each page. For example, users 'Adrignola' and 'Arien22' were each awarded a WB (Wikibook) award. This is clearly displayed on their pages. A 'Thank' was awarded by user 'Arlen22' on 12.22, January 2008 with the note "Thanks for all your hard work and dedication."

One of Wikibook's guiding principles is that original research is not included in the content. Content without references is allowed if it is considered 'common knowledge' to a general audience, or to the specific target audience of the book. However content that does not have a reference can be queried and deleted if no reliable source is cited. This is important in order to confirm the reliability of the information and it enables both truthfulness and accuracy to be verified. This feature is especially useful because it allows knowledge seekers in formal academic environments to use the Wikibook as a searchable, cross-referenced repository.

The following is an example of a conversation in *Introduction to Sociology*. There are two key participants in the conversation. User 'Tomsega' and user 'AndrewPeacock' are trying to find agreement about how best to present key aspects of content in the knowledge medium. It is of note that they are not creating new knowledge; instead they are crafting the content for presentation on the 'Book' page. It is clear that the conversation is being closely followed by at least one other. The discussion takes place on three levels: the first is related to content; the second is concerned with the rhetorical impact of the content; and the third is the interpersonal communication between the participants in the conversation.

Their personal profiles are clearly visible. For example Tomsega's profile, written in the third person, states that:

> Thom (1986) is a British person. He went to the <u>University of Birmingham</u> and currently resides in <u>Seoul</u>, teaching the children how to talk English good isn't it.

He has considerable Wikipedia status and numerous credentials. For example, he was awarded the following Barnstar on 17:46, 30 March 2010 by user 'Piotr Konieczny aka Prokonsul Piotrusasks:

> As a thanks for your <u>boldness</u> and your continuous efforts to improve sociology-related articles, I hereby award you this original barnstar. Keep up the good work! --<u>m3taphysical</u>

18:27, 22 December 2009. *The Missing Barnstar* is awarded to Wikipedians who are long overdue for a Barnstar due to their efforts - and you certainly deserve one for your great contributions to sociology-related articles in the past months! Thank you, and keep up the good job! (17:46, 30 March 2010)

The modal affordances of interpersonal communication are visible in this sample conversation. Unlike the previous two comparators, greater degrees of spontaneity and turn taking are apparent as the participants engage in both giving and getting a response. The personal idiosyncrasies of the authors' personalities and motivations are appearing. The tone is more appropriate for a small, intimate personal interaction rather than a large anonymous audience. Throughout the following conversation there are no indications of behind-the-scenes interactions such as background whispering. The conversation is being fully played out in a transparent manner on the 'Talk' page.

While the following analysis shows that the communicative role of text is changing as it takes on more of the elements of conversation, the interaction is still very much shaped by the affordances of text. It still aspires to emotional detachment, the arguments are highly rhetorically developed and linear, and the content is carefully considered.

An analysis of the interaction on the sociology Wikibook in the conversation below shows that the participants are actively engaged in building support for their ideas. On 2 May 2010 user 'Darwin Peacock' wrote:

> I think the Epistemology and Ontology section does a poorer job of capturing that subject than the "Positivism and Antipositivism" section.

User 'DarwinPeacock' is developing a carefully worded rhetorical argument backgrounding his reasoning and justifying his position. In the following conversation he invests time in building a persuasive argument to support his changes:

> Since the Positivism & Antipositivism section is quite well-written and thorough, the elaboration in the E&O section is unnecessary. Though this conflict is quite important historically, having two sections about epistemological debates on the main sociology article misrepresents its present-day significance. Both "positivism" & (especially) "antipositivism" are historical terms and are not a good fit for present-day research.

User 'DarwinPeacock' is anticipating the readers' response to his contribution and appeals

directly to the wider audience. Note the self-effacing, non-confrontational introduction to his key point:

> My guess is that very few researchers would identify as either one or the other. "Analytic" VS "interpretive" (and especially "quantitative" and "qualitative") would be more current terms for epistemological/methodological splits in the discipline, but they are better as references to research rather than researchers. The current trend in the discipline is towards mixed-methods research, which usually takes the form of a mixture of interpretive and statistical methods. There are certainly debates that are drawn across lines that resemble these, but they are not the positivist-antipositivist debate per se: they are more like debates over whether public sociology is a good idea, whether qualitative methods can have the reliability of quantitative work, or what sociology's stance towards evolutionary biology should be, etc, etc. These debates echo the positivist vs antipositivist one, but they are nowhere as fundamental or as polarizing, and many sociologists pay little heed to them.

Although the text above features a discursive tone the argument is still linear, and is a carefully rhetorically structured preamble leading to the key point:

> My point in bringing this up is this: the Positivism & Antipositivism section is quite good, but what it needs is a short conclusion--not a whole second section detailing the many specific stances further academics have taken on the issue. The vast majority of sociological writing is about the *content* of sociology and is not particularly concerned with epistemology--and there is no reason for the main sociology article to devote so much space to it.

The primary driver of the extensive preamble has been relationship maintenance. Note the use of the word 'we' as an effort to achieve inclusiveness and buy-in:

> I would like to delete the E&O section and slightly expand the P&A section by talking about how today the debate is a creative tension that is present but plays a background role. (The conclusion could also talk about how the different national traditions of sociology have diverged on this.)

> P.S., I also wanted to point out that we should be much more careful about referring to present-day research as either positivist or antipositivist. Very few currently writing academics belong clearly in one camp or another, and even fewer actually identify with those terms. If it is necessary to make these distinctions about contemporary research, we

should strive to be more precise: one of qualitative/interpretive/humanistic or quantitative/analytic/scientific will usually be more appropriate than positivist/antipositivist (n.b., the words in each triplet are not synonymous).

Both of the key participants in this conversation are conscious of avoiding relationship breakdown in the interaction while simultaneously pursuing content related tasks:

> P.P.S., thanks for reading all of this if you have--I apologize for my wordiness. (05:51, 2 May 2010).

Approximately ten hours later user 'Piotr Konieczny aka Prokonsul Piotrusasks' asks for clarification. This user has been following the interaction but has not contributed so far:

> So are you planning on rewriting the sections? (16:57, 2 May 2010).

45 minutes later another relationship element appears in user 'Darwin Peacock's' response:

> Yes, I am planning on doing this. Just didn't want to blow away a whole section of the article with no warning (17:13, 2 May 2010).

User 'Piotr Konieczny aka Prokonsul Piotrus' has been observing the ongoing communication, and at this point he has chosen to assert his authority. He is qualified to intervene because he has considerable status in the community as evidenced by his numerous wiki awards. The following comment is a subtle message about wiki etiquette. In this case user 'Piotr Konieczny aka Prokonsul Piotrus' is not specifically telling user 'DarwinPeacock" what to do but is explaining the appropriate etiquette and editorial process in neutral terms. He positions his feedback in the first person and shows a clear concern with allowing user 'DarwinPeacock' to save face:

> Thanks. I find it helpful to move such sections that are being removed to talk, so others can try to rewrite and rescue them (17:25, 2 May 2010).

Five days later user 'Tomsega' responds. It is impossible to know precisely why this amount of time elapsed, but from a modal perspective this delay is meaningful and those engaged in the interaction (either visibly or lurking) will inevitably attribute a motivation to it:

> I strongly object to this section being removed. Incorporated within it are two topics/articles, in the philosophy of social science and structure and agency, which are of huge significance (22:08, 7 May 2010).

While there is limited facework (Burgoon et al, 2002) in the Vernon (1965) and the Carl (2010) knowledge media, in the wiki medium the transactional influences of the presence of others such as high levels of emotion and the desire to maintain harmony come into play. The transactional flow of communication between participants on the site shows elements of interpersonal risk-taking followed by face saving and maintaining relational norms. The interpersonal elements of the interaction appear in the following emotive and blunt exchange as the interaction between contributors becomes more spontaneous and agonistic. It is clear that the two participants in this interaction have some degree of interpersonal history: user 'Tomsega' is very aware that user 'DarwinPeacock' is American, and he attributes user 'Darwin Peacock's' position on sociology to his Americal perspective:

> I sometimes find, Darwin -- not criticising you at all by saying this because you've made some great contributions -- that you speak from a particularly American perspective regarding what you think sociology is/should be.

At this point user 'Tomsega' moves to restore the relationship by qualifying his outburst:

> Perhaps you were brought up in a strongly quantitative and pragmatic tradition. Sociology, for me, is very close to social philosophy, and looking at sociology in the vein of Weber, Habermas, Foucault and Giddens, epistemology and ontology are at the forefront of discussion, and abstract concepts which might seem redundant to the rigid statistician (modernity and postmodernity, for example) have an almost limitless significance.

There is a change of tone at this point in the conversation. Wikipedia contributors are encouraged not to 'raise their voices' by using typographic features such as exclamation marks and capital letters. One of the most strident forms of interaction permitted is the use of italics:

> Strict, number crunching sociology is important, but the discipline was founded *as a radical critique of modernity*. Structure and agency is far too important not to mention. At the very least we'd require a 'Structure and agency' section. As it happens when I created the section I called it 'Epistemology and ontology' -- ontology encapsulating that.

Then in the same post the user 'Tomsega' calls on an external theoretical authority to support his argument:

> Peter Winch's criticism of the social sciences is very fundamental and famous, Foucault's even more so. The dialogue between Foucault, Habermas and Rorty is one of the most

invigorating in recent intellectual history and shows how the gap is closing between sociology and philosophy after the linguistic turn, phenomenology, and post-structuralist trends.

Following this point user 'Tomsega' moves to reduce discord in the relationship by articulating an area of agreement:

I agree there should be a strong divide between epistemological debates over positivism that are almost purely academic and the reality of empirical social research as it informs businesses and governments. But I think the article does this quite well, or at least, better with a separate epistemology/ontology section dedicated to deeper philosophical questions. There is a separate 'Research' section which pays more attention to practical methodology, sampling, etc. (22:08, 7 May 2010).

As another attempt at conciliation, almost as an afterthought, he makes a spontaneous concession in a further post 20 minutes later:

I'll concede, though, that the section is a bit too wordy and difficult. It could also do with being moved down the page for the time being (this is where it was placed for a long time originally) (Tomsega 22:29, 7 May 2010).

A more spontaneous response from user 'DarwinPeacock' two days later reveals that both participants are seeking consensus. Although both are involved in an intense discussion, they each recognise the value of the interaction and want to keep the dialogue open and moving forward. In the following section user 'DarwinPeacock' is actively making compromises in order to find agreement. He has clearly thought carefully about his response and has been working hard on his latest version prior to responding to user 'Tomsega's' post:

Hi Tomsega--thanks a lot for your response. There are definitely strong splits about what sociology is/should be, and I think it's really important for us to have conversations like this to figure out how to steer the page towards being inclusive and representative of what's going on in the discipline as a whole. We all have our own perspectives on these issues, but I think we've been doing a great job of working together on this, and I hope we continue to do so.

Relational factors are strongly influencing the dialogue. Note how user 'DarwinPeacock' prefaces the following section with the passive "it sounds like" in order to avoid confrontation by personalising the conversation:

It sounds like much of the material in that section should be kept, though I still think it should be reorganized and reframed. As with a number of other sections of this article, it doesn't have much of a clear narrative, which makes it a bit hard to follow. (It would probably be clearer if the Structure & Agency bit was separated from the antipositivist bit.) The substantive problems I have with this section is that it doesn't place these debates in the greater disciplinary context, and that it doesn't elucidate the quantitative position on sociology. (As a side note, this position should not be confused with either number crunching or policy/business work: it is an effort to construct sociological theory, only from a very a different epistemological perspective.) I am going to start hacking away at this, and hopefully we can get it to a point we're both happy with (03:45, 9 May 2010).

This is followed by user 'DarwinPeacock' approximately six hours later:

And here's the result of this. Pretty much the original + context + quantitative response to epistemological challenges. Hope it works. P.S., I intend to clarify the antipositivist critiques and turn them more into a narrative when I have a bit more time (or you are welcome to do this as well of course) (09:35, 9 May 2010).

Nine hours later user 'Tomsega' responds in a post that shows he has given considerable thought to the proposed changes. At this point the two key participants have resolved a number of their differences and found considerable agreement. The interaction shows a high degree of collaboration:

Okay cool, I like it. I've made some very minor adjustments on the page. Most obvious being that I certainly think the section can still be entitled 'ontology and epistemology'! Otherwise I haven't changed much except a few corrections to punctuation. Also, separated Habermas quote and added another quote on Giddens' view of the 'Third wave' of social theory after the 1960s. Tried only to make these adjustments to the sections I myself have written and leave yours as they are (18:09, 9 May 2010).

This is following by a clear attempt at relationship maintenance on user 'DarwinPeacock's' part. He begins his response with an affirmation:

Hey man, it's looking good. I agree that the O & E title is better. I think I should rename some of the subheadings too.

Then he offers some suggestions regarding presentation style:

One comment though--I think the "quotation" form is a bit too attention-grabbing for quotes from secondary sources, like with the Cassell quote here or the Harris one above (there's a "quote" template that makes text not stand out as much). The way that the "quotation" bits stand out from the text breaks up the flow in a way that I think works well with forceful primary quotes, but not so well with secondary one. I don't know if this makes sense, but it's like the "quotation" bits are us breaking up the narrative to include somebody describing their stance in their own language. I'd personally prefer the "quotation" template reserved for a few key quotes from primary sources that really sum up somebody's stance in their own words--and the "quote" (or just paraphrasing) to be used otherwise. What do you think? (19:22, 12 May 2010)

This is followed by specific discussions about the extent to which a quote is primary or secondary:

Yeah I agree actually. Secondary sources and editors don't deserve these stand-out quote boxes. The Harris and Cassell ones might be better off just in speech marks. The Habermas quote as well really (Tomsega 16:39, 13 May 2010).

Five days later user 'DarwinPeacock' responds:

Hey, I am again concerned that we're making this article grow too long. My initial attempt to shorten the article by removing the epistemology/ontology bits instead turned out to, umm, lengthen it instead (18:31, 15 May 2010).

In the same post he adopts a self-deprecating tone as he refers to his poor editorial skills. He attempts to minimise any apparent appearance of a domineering tone by expressing the content in the first person. Throughout the conversation he uses the first person repeatedly, in particular using the term "I think":

Though this particular incidence might be attributable to my editorial skills, I think in general this kind of info creep might continue to happen whenever the choice stands between removing material or contextualizing/balancing it--the balance will always make the article grow longer. So, I do not want to advocate either the slash-and-burn or the

balance-everything approach, because I think neither will work in the long run. But I want to reiterate again that the overall length of this article is something of a concern--even though the quality of the material here is getting better and better.

He then calls upon the editing conventions of Wikipedia to support his position:

Pretty much, I think the problem is the level of detail. If you look at the other disciplinary articles, they are generally quite shorter and easier to glance through than this one (e.g., economics, anthropology, philosophy, physics). For the most part, they consist of much less "expert" material than this article--mostly shorter, easier-to-read summaries of topics rather than detailed expositions with lots of terminology. While we have better content and writing than a number of those, we function poorer as an overview piece than most of them. A casual reader wanting to learn about sociology from this page would quickly get frightened away (which would not happen with, say, the biology page). The difference that they employ short, simple summaries that link to the expert-level articles: and I really think that's the only way to go for a top-level disciplinary article. (Don't get me wrong, I think the detailed stuff is the essential content of wikipedia--it's should just go into its own pages).

User 'DarwinPeacock' responded at 18:31, 15 May 2010. His response also relates to how the presentation of the content would appear to the reader:

In this light, I am really not a big fan of stuff like the expansion of the functionalism/structuralism bit. As always, the expansion is well written and good from an expert-historical point of view, but it would be quite hard to get through for a casual reader (and this is a matter of the material and detail, not of writing--I think summarizing is the only way to make this easier). I agree that some of this stuff needs to be on the main page, but the main page is also missing other important theoretical components. If we've going to have long exposes on the (largely historical) functionalism/structuralism stances, we will also need another long expose on contemporary theoretical perspectives (most importantly Mertonian mid-range theory and analytical sociological theory, but also relational (network) theory, field theory, etc). Then, we would need a third bit to explain how they relate in time, geographical distribution, etc. The result would be very long and quite unwieldy. I think in the end, some version of all this material should get a on this article, or at least a clear reference to a page that mentions it-- but the only way to do that is to compact what we have now first, and let go of some of the niceties of including material in its full nuance and detail. We could also consider beefing up the mid-level articles, like the "social theory" and

"sociological theory" pieces. I think that's the only way of getting to an article that is both comprehensive and easy to read.

There are other voices in the conversation who are not directly participating —but their silence indicates that they are satisfied with the general direction and tone of the interaction. At 18:31, 15 May 2010 user 'DarwinPeacock' calls on the authority of the wider group:

Overall, I think we should try to shorten the article by 30% or so before inserting new blocks of material (and I mean 30% of text, not of white space--shorter sections are easier to read; though overall shortening is good, too). I would love to hear everybody's opinions on this. (Posting a link to this on the wikiproject as well, btw).

User 'Tomsega' responds four hours later:

I've been thinking the same thing, though indeed it is difficult because the content itself has been continually improving. I elaborated on one section further today because I think it is vitally important to delineate the differences between functionalism, structuralism, and the comparative irrelevance of 'conflict theory', because so many school text books are so useless at explaining this stuff they make sociology sound trivial.

One thought I had was simply to remove the "20th century developments section" as this entire part is copied in full and available on the history of sociology page. The problem with this little history section, though I myself wrote at least 50% of it, is that it is difficult to pick one narrative topic in describing the history of sociology, as we know it's a discipline of subfields. The emphasis at present is on the concept of modernity, which might form a backbone concept for the major theorists of the 20th century (Giddens, Habermas, etc), but is far from relevant to everything. (What was it again Randall Collins said about sociology 'losing all coherence as a discipline'?!) Also, I worry the article paints an image of sociology that is overly radical and pseudoscientific: there shouldn't be TOO much emphasis on things like critical theory and postmodernism (even if they are important) over methodological developments and research.

An even more simple thing would be to remove all unnecessary images, which I think is just about every image below the positivism section (22:14, 15 May 2010).

30 minutes later user 'DarwinPeacock' responds. He has clearly been deeply engaged with editing the content during that time:

Okay, I have made the following changes, which can be undone if you do not think it works: (1) removed 20th century history section entirely, (2) removing non-essential info about critical realism (my own addition) from structure and agency section (3) removed 4-5 non-essential images. What do you think? – (22:44, 15 May 2010).

Less than 30 minutes later user 'Tomsega' responded: "Wow! Way to be bold!" (22:44, 15 May 2010).

The term 'be bold' is very much in-group talk—for Wikipedians this term has a very specific meaning as equivalent to 'go for it'. Contributors are specifically encouraged to be spontaneous. Regardless of their formal qualifications, participants are encouraged to 'revise', 'reconfigure', 'edit, 'share' and 'clean up' their own and each other's pages, to take risks ('be bold') in their editing and to constantly review their own and others' contributions to the content.

User 'Tomsega' then wrote:

I think these are all good moves. I think removing the 20th century section is a great move for reducing the length (though I don't remember what was in it off the top of my head so am not sure if something important is missing now--I'm going to give the whole page a read-over when I have a minute). I also agree with cutting down on the room taken up by images, though I think images in general can be useful because they break up the text and make the page easier to take in without actually taking up too much room. So I am going to shrink the size of the images on this page and maybe insert a few of the other ones back. But I think we're on the same page here (02:23, 17 May 2010).

User 'DarwinPeacock' then responded:

Nice. I think with the 20th century section entirely removed it nicely shifts more emphasis to the social research section.

Just making one minor change: I think the Structure and Agency section should be moved up between functionalism and research after all, actually, keeping the remaining section just on epistemology. You might be able to come up with a better title for the section, or trim some of the paragraphs if possible (10:46, 17 May 2010) .

User 'DarwinPeacock' then added:

Ok, I will edit it and trim it, or maybe even distribute it to other sections if I can (20:38, 18 May 2010).

Eight hours later user 'DarwinPeacock 'further added:

All right, I just spent most of the day editing this thing. I cut a big section and wrote a big section. The result is about the same length as when I started, so I didn't achieve much shortening--but I hope the content is improved. Mostly, I removed much of my contemporary epistemology stuff and added material on 3 other types of positivism and on postpositivism. I will try to shorten things more via more compact phrasings and removal of detail when I have more time. In the process I paraphrased or cut lots of stuff. I hope you don't mind these edits--some of it was definitely on your turf. I think the whole thing is more coherent and complete now (but then again, it's my edits, so it's probably not too surprising that I think so) (DarwinPeacock 4:17, 19 May 2010).

At this point user 'DarwinPeacock' moves into a different interpersonal mode saying that he is "going to get a drink". This indicates a sense of completion, almost denouement, and shows that he is proud of their shared effort:

Thoughts? (... and now I am going to go have a drink to celebrate/lament the single longest editing session I've ever had on wikipedia) (DarwinPeacock 04:17, 19 May 2010).

Less than five hours later user 'Tomsega' responds. In terms of Wikipedia that is a relatively rapid response, but those who are awaiting a response will inevitably make meaning from the silence. Not only does he respond but he has deeply read what user 'DarwinPeacock' had written. There is a clear element of relationship management in his response. He began his feedback with a highly positive comment. He then proceeded to make several suggestions. He begins with idiomatic affirmation: "Aha, Great updates".

Then he adds two carefully worded suggestions:

There was a slight bit of repetition in the first sentence on positivism as it already states Comte came up with sociology and positivism a couple of paragraphs higher up - just shortened the opening of that paragraph slightly. Also, I'd really like to keep that Simmel quote in. I realise the goal at hand is to shorten the article but I think it's a really attractive piece of sociological writing (Tomsega 09:31, 19 May 2010).

At this point the exchange between the main two participants indicates that they have reached some sort of agreement. Four minutes later (indicating considerable heightened emotion—in this case spontaneity) user 'Tomsega' makes a highly collaborative suggestion. The contribution is unrehearsed and enthusiastic:

> Know what, I think we could almost start pushing for featured article status (having said that if the article is nominated a few dozen people will immediately start hacking away at it!) (Tomsega 09:37, 19 May 2010).

User 'DarwinPeacock' 02:48, 22 May 2010 voices his enthusiasm for this. Note the mutually understood initialism for featured article status (FA):

> Thanks for the cleanup. FA is a great thing to aim for--though we're not quite there yet! I think there's still lots of tightening to do. (Didn't realize FA nomination brought swarms of editors, but makes sense.) (DarwinPeacock 02:48, 22 May 2010).

Both user 'Tomsega' and user 'DarwinPeacock' are actively engaged in the 'doing' of knowledge. Rather than simply gathering and disseminating information they are working together to achieve some degree of interpersonal and content related harmony. They are both signalling a degree of pride in their shared effort.

In summary the introduction of aural modes of meaning making, such as increased capacity for rapid interaction and for silence (or lack of response from others), have become sensorially detectable and therefore epistemologically significant. This is subtly shifting the sensory bias in the Wikipedia knowledge medium. Whereas the two comparators were predominately located in visual modes, in the wiki medium increased elements of sound are appearing, even as mediated by text. In this knowledge medium all the subtleties and ambiguities that emerge in interpersonal engagement, such as heightened emotions, the natural tendency to attribute motivation and the use of face-saving strategies, have become part of the knowledge experience. The modal analysis of the wiki medium shows an increased level of interaction, freedom from constraint, and a sense of permission to participate spontaneously and contribute without embarrassment. This modal capacity is mediating the idea that consensus has as much weight as expertise. The nature of the knowledge that is being negotiated is being influenced by interpersonal elements such as the desire to conform to the conventions of the group and to garner support for ideas, sensitivity to others' emotions and the desire not to offend.

5.6   Towards valuing the voice of others

Whereas the analysis in sections 5.3 and 5.4 found a correlation between Schommer's (1990, 1993a, 1993b, latterly Schommer-Aikin's, 2012) ideas about sophisticated ways of knowing and the emerging influences of increasingly digitised forms of knowledge communication, Section 5.5 found that the knowledge beliefs being mediated by increasingly digitised knowledge media did not conform to Schommer-Aikin's findings about what constitutes sophisticated sources of authority. Rather than the knowledge seekers in the digital wiki knowledge environment finding authority in the rational processes of deduction, as theorised by Schommer-Aikin there are indications that in the wiki knowledge environment knowledge seekers are trusting the sensory experience of others as a basis of authority.

The analysis is Section 5.5 showed that the production processes associated with mass print mediated a highly asymmetrical power relationship between producers and consumers. The analysis of the Vernon (1965) knowledge medium, in particular, showed that the opportunities for interpersonal engagement with others were limited, the feedback loops were protracted and, the sources of authority became removed from the reader's personal experience, and difficult to challenge. As a result of the drawn-out production processes associated with mass print, the reader lost connection with the primary, personal sources of the content.

One of the epistemological consequences of this loss of connection was that the content became depersonalised. The analysis of the Vernon (1965) knowledge medium showed that the content is presented as being neutral rather than personal; there are no knowledge claims derived from the personal experiences of any one person and, other than in the front matter, there are no references to 'I'. The absence of the author in the Vernon medium meant that there was limited capacity for the reader to query the knowledge claims or engage in the knowledge generation process—thereby privileging the ideas of the author and making these claims unassailable.

Perceptions about the source of knowledge, or what counts as evidence, are powerful influencers of decision-making (Schommer, 1990, 1993a, 1993b, latterly Schommer-Aikin, 2012). The mute acceptance of authority, such as that offered by texts, can lead to intolerant and immature way of knowing about the world. Schommer argued that, while naïve epistemological beliefs were based on the authority of the text, sophisticated epistemological beliefs about knowing could be achieved by reasoning. In other words, sophisticated ways of

knowing could be arrived at through reducing and fragmenting things into their component parts. From Schommer's perspective, the development of more sophisticated beliefs is a process of moving towards more sophisticated levels of reasoning.

There are three ways that knowledge can be justified: by personal experience, through the authority of experts and through the general perception of a conclusion reached as a result of the processes of reasoning (Bakhtin, 1986). According to Bakhtin, authority based on absorption of texts encouraged immature ways of knowing because it mediated acceptance of the idea that content could be accepted intact without any internalisation, and without the ability to accept one part of the discourse and reject another. McLuhan (1994) agreed with this claiming that that idea that profound ways of knowing could be arrived at through the processes of reductionism was one of the illusions of modernism.

Schommer's (1993b) theory about naïve forms of knowing corresponds with Bakhtin's views (1986). However, the diachronic analysis of the three knowledge media in Section 5.5 indicated that, as the processes of digitisation are being incorporated into the knowledge sensorium, beliefs about the kinds of justifications being offered or accepted in support of knowledge claims are changing. While the analysis concurs with Schommer's view that more sophisticated ways of knowing involve a reduction in the authority of faceless and nameless authors, the findings also indicate that something new is emerging in terms of the authority of knowledge.

As knowledge media become increasingly digitised, justification for what is valued is being sought less on the basis of analytical engagement with data than through personal engagement with others who are mutually engaged in knowledge seeking. Whereas content created by a vetted expert was the primary authority in the Vernon (1965) knowledge medium, the wiki environment is mediating the notion that assessments about whether knowledge is trustworthy and reliable are increasingly based on interpersonal trust and empathic interaction.

5.7   Towards a secondary orality mediated by text

One way of reflecting on changes in beliefs about knowledge in the increasingly digitised knowledge sensorium is through the lens of Ong's emerging "secondary orality" (2012) (this was previously discussed in Section 2.3). Ong claimed that written text (particularly mass printed text) is a highly constraining knowledge medium. For example, he claimed that a

written text is basically unresponsive: "If you ask a person to explain his or her statement, you can get an explanation; if you ask a text, you get nothing back except the same, often stupid, words which called for your question in the first place" (p. 79).). From Ong's perspective, the "vast network of artificially contrived media" (1977b, p. 418)—here he is referring to writing, print, and electronic devices such as tape recorders or computers—were particularly limiting because they had the effect of separating words from their sensory home in sound.

As discussed in Section 2.3, a number of theorists have broadly speculated that the increased digitisation of knowledge media will, to some extent, restore the knowledge values associated with oral ways of knowing (Levinson, 1997, 1999; McLuhan, 1994; Ong, 1977a, 2012; Perkinson, 1984; Pettitt, 2009; Strate, 2012b). This return to the values associated with orality was what Pettitt (2009) was referring to when he used the term "the Gutenberg parenthesis" to signal the end of the era of print and a return to the more fluid knowledge values of a time prior to the printing press. Foley (1996) similarly anticipated a return to more dialogic ways of knowing in an online 'agora' (a market place or meeting place) for oral exchange.

The analysis in Sections 5.3– 5.5 has shown that, as these theorists predicted, the beliefs about knowledge that are emerging in the increasingly digitised knowledge environment resemble those of an oral world, albeit mediated by written text rather than through face-to-face communication. However the analysis also indicates that, as knowledge media become increasingly digitised, the emerging sensory experience is not the sound infused secondary orality that Ong (2012) predicted would emerge as a result of reemergence of the acoustic medium. The technologies, such as television (as perceived in the 1980s as a medium that mediates mass messages), that Ong anticipated would mediate this more oral/aural knowledge environment have turned out to be passing phenomena. The key point is that these technologies are based on a one-to-many, mass communication model rather than the emerging interpersonal interaction that was shown in the wiki style knowledge medium. As opposed to the drawn-out timeframes that always went hand-in-hand with textual forms of engagement in the period of mass print, textual communication via increasingly digitised social media (such as the Wikibook example) can be highly spontaneous and responsive.

Ong's personal experience of mediated communication resulted in his particular stance on the virtues of orality and his speculations about a secondary orality. His death deprived him of the opportunity for a vantage point that would allow intellectually distance from the mass communication epistemology that framed his theorising about the future. With the benefit of

the wider perspective of the passage of time (Wertsch, 1991, Kuhn, 1962), it is becoming clearer that the sight/sound dichotomy that Ong (2012) originally theorised was the key component in distinguishing oral from literate ways of knowing, was based on mass-printed forms of knowledge media. That knowledge media might mediate the knowledge beliefs associated with orality, while using text as a primary communication medium, was not a possibility envisaged by Ong. In Ong's pre-digitisation era, the affordances of primary oral engagement were perceived as only achievable through face-to-face communication via the medium of sound because the presence of the other and the spoken word were always perceptually co-present.

In the analysis of the wiki style knowledge medium in this chapter, knowing is mediated primarily by text. While there has always been a residual correlation between text and talk (Eisenstein, 2013; Ong, 2012), the analysis showed that this correlation is becoming more obvious as text is increasingly acousticised (Levinson, 1999; Soffer, 2010, 2012). Contrary to Ong's (2012, p. 74) claims that writing and print separate the author and the reader, the analysis in Section 5.5 has shown that in the Wikipedia knowledge environment writing and print are becoming increasingly reattached and the medium of text is mediating some of the affordances of the spoken word, even as those engaged in knowledge seeking are physically separate from each other.

This re-emergence of the human voice as mediated by the medium of text has an historical precedent. The textual communication that is emerging on the Wikipedia page has a much more informal, idiomatic style, akin to chirographic writing: the stage of handcrafted, personalised writing that was used prior to writing becoming standardised. Historians (Eisenstein, 2013; Goody, 1977) claim that, prior to the formalising influence of the printing press, individualised expressions using the mode of text were the norm. The more spontaneous informal way of communicating that is shown in the Wikipedia knowledge medium is breaking down the formalising, distancing conventions that were mediated by the one-to-many conventions of the printing press.

On a sensory level the shift from intense visual detachment to aural engagement is reactivating a significant turn to 'talk' that has the potential to mediate a different knowledge experience. The sense that coming to know is increasingly anchored in interpersonal communication has profound epistemological implications. This increased interconnection with others is highly epistemologically significant because, as soon as human beings come into the presence of

others (either physically or via social media), a new set of transactional communicative behaviours—for example, face saving and impression management—come into play (Buber, 1987; Craig & Muller, 2007; Goffman, 1959; Ong, 1977, 2012).

In conclusion the analysis in Sections 5.3 -5.5 shows that it is not just the phenomenological emergence of the sense of sound that is mediating sensory differences in the knowledge experience in the wiki knowledge environment. As well as the sensory stimulus of sound it is the sensory stimulus of the presence of the others who are mutually engaged in coming to know that is having a highly significant phenomenological impact. The analysis shows that the phenomenological impact of the increased proximity or distance of the presence of the other or others who are mutually engaged in the social act of coming to know is also significantly influencing emerging epistemological beliefs. This sense of the presence of others is mediating a more dialogic rather than intellectual knowledge experience.

5.8   Summary of Chapter 5

Chapter 5 established and applied the methodological framework by which the temporal, spatial and aural modes that were detected in the three examples of knowledge media were differentiated and compared. It micro-analysed and compared selected compositional modes along three diachronic axes based on McLuhan's (1994) sensory extensions of time, space and sound. Each of these axes broadly corresponded with one of Schommer's (1990, 1993a, 1993b, latterly Schommer-Aikin's, 2012) three epistemological beliefs. The findings showed significant changes in the sensory experience of knowledge over the 50 year period.

The analysis of changes in the temporal experience of knowledge (Section 5.3) showed that in the Vernon (1965) knowledge medium knowledge is presented as existing almost out of time. In the Carl (2010) knowledge medium the time frames are considerably reduced and there is a greater sense of immediacy. The Wikipedia knowledge medium locates every interaction within a highly specified timeframe—in this knowledge medium not only are the dates of the various contributions an element of the knowledge experience but also the hours and minutes. This analysis indicated that in the wiki knowledge environment there is a loosening of the temporal constraints associated with mass-printed text. The analysis of the changing modal composition showed that the perception that the field of sociology is composed of a stable, core

body of truths that can be mastered and will remain constant over an extended period is lessening. This increased acceptance that knowledge is in a constant state of flux is highly epistemologically influential because it mediates the possibility that claims for absolute truth can, and should, be treated with suspicion.

The analysis of changes in the spatial experience of knowledge (Section 5.4) showed that, in the Vernon (1965) knowledge medium, in particular, the highly mechanical processes associated with the production of mass-printed knowledge media had the effect of systemising the content into a number of two-dimensional, tree-like taxonomies. These mediated the perception that the appropriate route to knowing was a process of moving through the medium from general to specific, and from simplistic to increasing complexity. The Vernon medium presents knowledge as a prescribed template encased in a materially substantial format, with clear distinctions between subject categories that mediated the belief that 'the answer' was clear and could be found within the text. Although there are some references to external resources in the medium in the form of citations of others' work and references to the theories of others, these are positioned as peripheral to the main content. The spatial modes in the Carl (2010) knowledge medium present knowledge in a more disposable, malleable and less didactic format. The frequent references to online adjuncts are mediating the perception that it has portal-like elements rather than being a self-contained standalone medium. The Wikibook knowledge medium is much less didactic than the other two examples—its format does not insist that some things have greater, predetermined epistemological significance. Rather than the content being, to some extent, pre-ranked, it is presented with a range of perceptually equal options and it is up to the knowledge seekers to choose for themselves which path to follow. Although the knowledge on the 'Book' page is presented as a pre-established taxonomy there is the sense that this taxonomy is subject to ongoing renegotiation.

Analysis of the changing spatial modes in the three examples of knowledge indicates that an 'opening up' is occurring in the way that knowledge media mediate perceptions of spatiality. The analysis indicates that there is increasing recognition that knowing and knowledge are complex and always contextualised in the world outside the medium. Lunenfeld (2011) refers to this breaking down as a process of 'aetherisation'. This less categorical approach is mediating the epistemological belief that there is no single 'right' answer and that different, often conflicting, points of view are able to comfortably coexist.

Section 5.5 analysed how the sound of the others who are mutually engaged in the knowledge exchange is enhanced or inhibited by the material composition of the medium. In the Vernon (1965) medium the modal composition positioned the act of coming to know as a private, inward, contemplative experience where the primary relationship was between the reader and the text. In the Carl (1965) medium, although voice of the author predominates, there is a greater sense of emotional engagement with the content on the part of the reader, and the relationship between the reader and the author is more equal, engaged and intimate. The analysis of the Wikipedia medium indicates that knowing is increasingly situated in the social world and that the other or others who are mutually engaged in the knowledge transactions are increasingly present. The sensory experience of these others means that transactional behaviours (or breaches of the social norms surrounding these behaviours) such as listening, face-saving, turn-taking, responding and empathising become significant sensory elements in the knowledge experience.

The emergence of the sound or sense of the other is mediating a number of subtle epistemological changes. One of these changes is that coming to know about the field of sociology (as in this case) is increasingly being perceived as a process—a verb—rather than intellectual engagement with a pre-established body of knowledge. In the Wikipedia knowledge medium knowledge is presented as a mode of action. This is subtly mediating the impression that knowing is dynamic and contingent upon those who are engaged in the knowledge interaction. In the Wikibook knowledge medium there is an increased sense of mutual, active, sense-making rather than absorbing the knowledge that has been generated by someone else. Ong describes this as a sense of "something going on" (Ong, 1977a, p. 12).

While passing a value judgment on whether or not positive changes are occurring as a result of the changing materiality of knowledge media was not a stated aspect of the research question, a value judgment was implicit in this analysis: the discussion in Section 1.1 clearly states that the desire to investigate the influence of the Vernon (1965) knowledge medium was sparked by my suspicion that this medium had, in some way, distorted my perception about the nature of knowledge. As previously discussed value judgments about the influence of mass-printed media are implicit in the theories of Ong (1977a, 1977b, 2012), McLuhan (1962). Gergen (2009) and Kress (2003) and the field of epistemological beliefs positions knowing on a naïve to sophisticated continuum.

As discussed in Section 2.3 Ong had deeply held convictions about the loss of the communicative affordances of orality. He perceived the medium of mass-printed text as a "constriction" (1977a, p. 300) and in his writings he openly states that one of his aims is to liberate our text-bound minds and "[set] much of what has long been familiar in [a] new perspective" (2012, p.156). McLuhan claimed to be medium neutral. Rather than perceiving different forms of media as 'good' or 'bad' he claimed that his aim was to develop an intellectual lens for cutting through ambiguity and "stepping outside the system" (p.129)—as Strate (2008) describes it. However, a value judgment is implicit in McLuhan's theorising. His claims that the computer had the potential to create a "perpetuity of collective harmony and peace" (p.18) belie his claims of media neutrality. Gergen, and Kress also regarded the changes to knowledge and knowing in the increasingly digitised knowledge environment as emancipatory. They both framed these changes in light of a process of democratisation as the increased accessibility of resources, and the increased number and rapidity of feedback loops are increasing the number and range of 'voices' who are able to participate in the social process of forming socially constructed meanings.

The field of epistemological beliefs provides a way of passing a value judgment. The analysis in Sections 5.3 and 5.4 found a correlation between Schommer's (1993b) ideas about sophisticated ways of knowing and the emerging influences of increasingly digitised forms of knowledge communication. Section 5.5 found that the knowledge beliefs being mediated by increasingly digitised knowledge media did not conform to Schommer's (1990, 1993a, 1993b, latterly Schommer-Aikin's, 2012) findings about what constitutes sophisticated sources of authority. Rather than the knowledge seekers in the digital wiki knowledge environment finding authority in the rational processes of deduction, as theorised by Schommer-Aikin there are indications that in the wiki knowledge environment knowledge seekers are trusting the sensory experience of others as a form of authority.

Contrary to Schommer's claims coming to know in the increasingly digitised knowledge environment is a process of interpersonal communication with others—rather than a process of reductionism. While there is widespread intellectual recognition that all knowing is on some level— even in the temporally protracted engagement occurring with mass-printed knowledge media —a process of dialogical engagement with others (Bakhtin, 1986; Ernest, 1998; Gergen, 2009; McLuhan, 1962; Ong, 1977, 2012; Poster, 1995) this is not apparent in the first two examples of knowledge media. In fact the distancing of the participants engaged in coming to

know as reflected in the two examples of mass-printed knowledge media is deeply at odds with what philosophers believe about knowledge and knowing. From the perspective of Gergen (2009) and Kress (2003), these knowledge media have simplified and shut down communication and marginalised those groups and those ways of knowing that did not conform to the analytical style associated with the structured approach to knowing. The analysis has revealed that, overall, the less stable, less confining, more spontaneous material composition of digitised knowledge media is mediating more "sophisticated" beliefs about knowledge.

Section 5.7 considered the findings in light of Ong's theorising about an emerging 'secondary orality' (2012). The analysis in Sections 5.3 -5.5 showed that it is not just the phenomenological emergence of the sense of sound that is mediating sensory differences in the knowledge experience in the wiki knowledge environment. The sensory stimulus of sound is significant in the changing epistemological experience but the analysis also shows that the phenomenological impact of the increased proximity or distance of the presence of the other or others who are mutually engaged in the social act of coming to know is influencing emerging epistemological beliefs. This sense of the presence of others is mediating a more dialogic rather than intellectual knowledge experience. This increased presence is opening up the possibility of a more nuanced understanding of human motivations and that a deeper empathic engagement with others will become increasingly important components in decisions about what is perceived to be valid and true.

6   A critique of the strengths and limitations of the lens

The aim of this research was to examine how the medium by which knowledge is stored and shared influences beliefs about knowledge. The research was sparked by my curiosity about a forgotten textbook from 1965 that I had found in a storage cupboard. Although this particular textbook was out of the general 'ebb and flow' of daily use I had a strong sense that it and others like it had contributed to the development of a number of unconscious but highly influential beliefs about knowledge. Examples of these epistemological beliefs include the perception that knowing is an objective, emotionally detached experience; that knowledge can be unchanging; that it is possible to know about the world as a certain, unambiguous, decontextualised story; and that there is a body of correct knowledge that can be absorbed and is considered to be appropriate for everyone. I was aware that influential noetic perceptions such as these were flowing through the medium and unconsciously influencing my, and my students', epistemology and world-view—the challenge was identifying these influences and understanding how they arose.

This concern led to the research questions: how do knowledge media shape perceptions of knowledge? This question had two dimensions. First, what are some of the specific epistemological influences that the medium by which knowledge is stored and shared has on perceptions of knowledge, and how are these changing as the material composition of these media become increasingly digitised? Secondly, what are the sensory processes by which knowledge media influence perceptions of knowledge?

Chapter 5 addressed the first part of this research question. While the findings in Chapter 5 are an important element of the research, as discussed in Sections 2.1, 2.2 and 2.3, both McLuhan (1962, 1994) and Ong (1977a, 2012) had already broadly anticipated the epistemological changes that the analysis in Chapter 5 revealed. The focus in Chapter 5 was therefore generally a confirmation of what had already been anticipated rather than being an original contribution to knowledge.

Chapter 6.0 reflects on the effectiveness of the lens that was developed to address the second part of the research question: what are the sensory processes by which knowledge media influence perceptions of knowledge? It is this lens that is the original contribution that this research makes to knowledge. This chapter is a critique of the strengths and limitations of this

lens. It reflects on the efficacy of the lens as a tool for explaining and demonstrating how the 'micro' processes by which individual acts of sensory engagement with material modes accumulate to form individual epistemological beliefs and cycle out to form broader 'macro' normative cultural assumptions about the nature of knowledge. It reflects on four particular methodological challenges that arose during this research.

Section 6.1 discusses how effectively the lens detected the influence of specific material modes in the sensory experience of knowledge. One of the methodological issues that arose was that, in terms of the material nature of knowledge, some of the most influential modes were those that were absent from one or more of the knowledge media. The second section (6.2) reflects on the methodological effectiveness of separating the experience of knowing into the sensory strands (or extensions) of time, space and sound. These sensory extensions (McLuhan, 1994) provided the framework for differentiating and examining the perceptual influence of each knowledge medium. The third section (6.3) discusses the methodological effectiveness of diachronically comparing the small modal shifts between the three comparators over a 50 year period in order to identify similarities and differences, and in order to examine emerging trajectories or 'ruptures'. Section 6.4 discusses the strengths and limitations of applying the heuristic of epistemological beliefs as a framework for narrowing the epistemological focus, and the validity of this framework as a way of attributing value judgments to beliefs about knowledge.

6.1   The effectiveness of micro analysing modal composition

This section reflects on the effectiveness of micro-analysising the modal composition of the three comparators in order to detect how their unique modal composition influenced beliefs about knowledge. In order to investigate the sensory experience of knowledge it was necessary to find a way to stand aside from the perceptual influence of the three examples of knowledge media chosen in order to register differences, identify patterns and make comparisons (Nicholls, 2005, p. 25). McLuhan (1969) argued, "Only by standing aside from any phenomenon and taking an overview can you discover its operative principles and lines of force" (p. 3). The development of this lens was a means to facilitate this 'standing aside'. Achieving such detachment from the analysis was methodologically and personally difficult. As a way of doing this the research focused closely on the modal composition of the three examples of knowledge media.

To achieve this detachment the micro-analysis carried out in Sections 5.3-5.5 isolated various modal features of the three comparators into discrete elements to form the research data. These elements included, for example, the symmetry of the page layout, the thickness of the stock (where the medium is in print form), the extent to which the images are embedded in the text or an adjunct to the meaning, the number of hyperlinks, the degree and variation in feedback loops, the visibility of dates and times, the extent to which the background editing processes are visible, and the extent to which elements of the author's personal life and motivations are revealed in the medium.

The methodological benefit of this close focus on material composition was that it provided a perceptual lens for examining the three examples of knowledge media on the same phenomenological plane regardless of the considerable variations in their material composition. In other words it enabled a mass-printed paper textbook from the mid-20th century to be examined on the same phenomenological continuum as a digitised website from 2015. This was crucial because, despite their apparent similarity, the page and the screen are different forms of media, and therefore the methodologies for analysing two-dimensional conceptions of knowing are not necessarily adequate when knowing is increasingly embedded in social interaction, even when mediated by screens. In particular the focus on material composition provided a way of recognising that all dialogic interaction has elements of materiality—albeit sometimes evanescent materiality, and that mass-printed knowledge media like textbooks include elements of dialogue—albeit extended over a prolonged time period.

The analysis of modal composition revealed a number of material changes between the three knowledge media over the 50-year span of their production dates. It showed a loosening of the formal placement and sequencing of material elements such as font size and position. The careful symmetry and consistency of headings has become more casual. In the Carl (2010) knowledge medium dates and times were directly referenced, and this inclusion of temporal locators had increased considerably in the Wikipedia knowledge medium. In the Vernon (1965) and, to a slightly lesser extent, Carl (2010) knowledge medium the knowledge seeker's gaze was confined to one standalone medium as opposed to a more broad-ranging engagement with diverse forms of knowledge media. The images in the Carl knowledge medium were more integrated into the medium and, unlike the Wikipedia medium, there were images on almost every page. In the Wikipedia knowledge medium the ratio of text to image was much greater.

Most importantly, the analysis of the three comparators showed that the number and pace of the feedback loops had greatly increased over the 50-year period. This change was found to be highly epistemologically significant because it influenced the extent to which the medium limited or facilitated reader engagement throughout its production, distribution and consumption cycles, and the extent to which the presence of the author (or others involved in the knowledge "doings" (Ong, 2012, p. 43)) was visible in the medium.

Although the emphasis on materiality did reveal considerable changes in modal composition across the 50 year time span the use of materiality as the investigative yardstick had some limitations. One limitation was that the modal elements, particularly in the case of the Wikipedia knowledge medium, were materially very different. For example, compared to the two earlier media, the Wikipedia knowledge medium was relatively materially evanescent.

Another methodological problem was the unavoidable temptation to select the modal elements that supported the research claims and to reject or under-emphasise other elements. As discussed in Section 5.2 this research did not claim that the three comparators were based on empirical data selection methods. Similarly it did not claim that the specific material modes chosen for comparison were selected empirically. Nevertheless, the issue of what strands of materiality were foregrounded and what strands were omitted from the comparison is an important consideration when the assessing strengths and limitations of the lens. Some modal elements (for example the colourful images in the Carl (2010)) medium have greater sensory impact or intensity. Other modal elements may have been overlooked because they were more familiar. As a result, although the focus on the unique modal composition of the medium provided a degree of intellectual detachment, the natural and inevitable tendency on my part to select modal features that fitted the narrative could well have influenced the findings.

Another problem that arose was that in some instances in the analysis the modes that were most significant in shaping meaning were those that were absent. This research applied modal analysis to address the question of not only what the modal elements of each of the three media afforded in terms of sensory experience, but also what they constrained in terms of sensory experience. From this perspective the absence of specific communicative modes influenced the sensory balance of the knowledge experience. The methodology detected absent modes or minimised modes communicative modes by applying a diachronic lens retrospectively. For example a retrospective comparison of the modes in the wiki knowledge medium revealed that

the modes that facilitated interpersonal interaction were absent in the Vernon (1965) knowledge medium and limited in the Carl (2010) medium.

6.2   Separating sensory experience into time, space and sound

The unique modal composition of the three comparators forms the primary data in this research. This modal composition, such as the amount of white space, the number of feedback loops, the degree to which the content is pre-organised as opposed to unfolding in real time, is only significant to the extent that it influences sensory experience. The idea that knowing is a sensory response to the knowledge medium is one of the main tenets of media ecology, and this is what McLuhan (1962, 1969, 1994), Ong (1977a, 2004, 2012), Postman (1979, 1982, 1992, 2005) and Strate (2008) are referring to when they claimed that each of the different senses (particularly sound and vision) mediate different kinds of perceptual bias. As discussed in Section 2.1, from a media ecology perspective the distinction between perceptions of what was considered valid and valuable knowledge in the three main epistemological periods (primary orality, literacy and secondary orality (Ong, 2012)) arose as a result of variations in individual sensory engagement with the knowledge media of the age.

As stated in Sections 1.1 and 4.6, when I began this research I was aware that, on some unconscious level, the Vernon (1965) medium exerted a powerful, unconscious sensory and epistemological influence. However, developing a methodology to unravel and observe this influence was difficult because sensory data is difficult to capture, and it is so personal that it is difficult to attribute generalised meaning to it. For example, the publishers of the Carl (2010) knowledge medium have gone to extraordinary lengths to integrate theory and graphics by developing highly coloured and detailed graphical representations of the theoretical concepts.

From a media ecology perspective knowledge media, like those analysed in Chapter 5, are highly perceptually deceptive because their material composition influences the subtle sensory experience of knowing in unconscious, difficult to detect and generally unintended ways. These sensory experiences are difficult to identify but, identified or not, they accumulate to form the sensory 'medium' (McLuhan, 1994; Postman, 2005) or 'sensorium' (Ong, 1977a, 2012) that comprises broader normative discourses or cultural agreements about knowledge or knowing. For example, the accumulated sensory experiences of knowledge associated with the Vernon (1965) knowledge medium accumulated to form the unconscious perception that

knowledge and knowing was a static 'thing' located in an abstract world that was external to subjective feelings and emotions, and that could be mastered.

In order to differentiate and describe sensory engagement with knowledge media the methodological lens developed in this research divides the sensory experience of the three comparators into the three 'extensions' (McLuhan, 1994) of time, space and sound. One of the problems with this division is that it is artificial because sensory experience cannot be neatly differentiated and compartmentalised. Nevertheless McLuhan's sensory extensions do provide a way of organising and making sense of sensory responses to material composition. The extensions provide a way of thinking about the extent to which the three knowledge media are temporally sensitive, the extent to which they are contained within the confines of the book or aetherised (Lunenfield, 2011) in the external world, and the extent to which they mediate or limit sensory perception of the presence of the other or others also participating in the knowledge experience.

To be effective, the methodological lens needed to examine not only the sensory experience of space and time (the two primary sensory influences apparent in the earlier two knowledge media) but also the complex, intensely sensory experience of emotionally engaging with others that is at the heart of the dialogic interaction that is central to constructivist ways of knowing. While the material indicators of variations to time and space could be easily perceived, and therefore were easy to discuss in material terms, the third extension (the voice or 'sound' of the others engaged in the knowledge experience) was more difficult to detect and analyse. The methodology developed in this research addressed this by examining the extent to which the voice (even as expressed in text) of those engaged in the knowledge transaction is part of the knowledge experience, and the extent to which those engaged in the knowledge experience mutually influence each other's behaviour as they respond, in some way, to each other's presence.

A key problem with making generalised assumptions about sensory experience is that there is no way of knowing what unconscious meaning individual students attribute to various modal elements such as, for example, highly developed visual graphics. Do they look closely at them and attempt to interpret the intended meaning, or do they engage superficially and interpret them as simplified 'sound bites'? In order to address this problem the interpretation of sensory influence on epistemological beliefs could have been further supported by incorporating knowledge seekers' feedback about their sensory experience of knowledge media.

This could have been achieved by, for example, conducting interviews or asking knowledge seekers to record their sensory impressions. While this approach may offer some insight into knowledge seekers' epistemological perceptions this approach is problematic because it raises the question of whether or not sensory perceptions can ever be reliably reported. For example, the increased sensory experience of engaging with a wider range of knowledge sources (via Wikipedia) is increasingly part of the knowledge experience but students may not admit to using Wikipedia in their assignments because this has, until recently, been perceived as covert knowledge seeking behaviour. Furthermore, in order to reliably contribute to the research, any analysis of students'sensory engagement (whether self-reported or captured by some other means) would need to be conducted over an extended period of time because the "patterned practices" (Poster, 1995, p. 67) that accumulate to influence beliefs about knowledge take place over an extended timeframe.

From a methodological perspective one of the affordances of the Wikipedia knowledge medium was that all the micro-dynamics of the interpersonal interaction that had occurred since the medium was first developed are available for analysis. The micro-interactions between co-present others are permanently visible in the Wikipedia knowledge medium, and therefore there is a much greater opportunity to detect and examine the sensory interaction afforded by the medium.

6.3   Making sense of knowledge over an extended timeframe

The third methodological approach that contributed to the analytical lens that was applied in this research was a diachronic comparison of the three comparators over a 50-year period. This diachronic comparison was applied as a 'strange-making' strategy. The Vernon (1965) knowledge medium was perceptually familiar, with a form that had been used extensively in formal educational settings since the 16th Century—it was so familiar that the influences of its material form have become difficult to perceive. The highly symmetrical pages, the carefully ordered flow of meaning and the minimisation of the presence of the author had become unconsciously accepted as the appropriate form for representing knowledge.

In order to highlight the strangeness of the Vernon (1965) knowledge medium, and the random subsequent influence that its strange material composition had on perceptions of knowledge, it was compared with two more-recent examples of knowledge media. From a methodological perspective one of the factors that contributed to the appropriateness of this diachronic

approach was that the unique 50-year time span along which the analysis was conducted was highly materially eventful. In the period from 1965 to 2015 the material composition of knowledge media has changed significantly due to the incorporation of the processes of digitisation into all stages of the production, distribution and consumption cycles. McLuhan (1969) described this rapid material change as one of the affordances of the 'new media'. He stated that change proceeded so instantaneously through the new media that it may be possible to recognise the future and "to seize the reins of our destiny" (p. 3).

Although only three examples of knowledge media were compared, they were compared deeply. Close examination of a small number of examples is a well-established methodological approach that is widely used in media analysis, particularly multimodal analysis (Bezemer & Kress, 2008; Jewitt & Kress, 2003; Jewitt, 2005a, 2005b, 2006, 2007, 2008; Jewitt, Kress, Ogborn, & Tsatsarelis, 2000, Kress & Van Leeuwen, 2001; O'Halloran & Smith, 1999).

As discussed in Section 2.3 Ong (1977a) queried the extent to which most forms of comparative analysis of texts is diachronic because, according to Ong, most time-based analysis does not include an example from a time prior to when the conventions of literacy, particularly the conventions of literacy that arose from the technologies of mass-print, dominated perceptions of knowledge. From this perspective this research is genuinely diachronic—not because it includes a comparison with a knowledge medium from the pre-literate, oral period—but because the wiki knowledge medium is representative of emerging patterns of production, distribution and consumption, post the conventions of mass-printing.

One of the pitfalls of this diachronic approach was that it implied a trajectory for the future direction of knowledge media. This research made no claims about the future except as an area for future research. Nevertheless, one of the inferences of this extended, diachronic approach was the perspective that, if it is theoretically valid to accept that placing a knowledge medium from the past (1965 in the case of Vernon) at the centre of the analysis and closely examining how the materiality of that medium shapes the flow of interaction, then subjecting emerging knowledge media to this same scrutiny will allow speculation about possible epistemological discourses that might be mediated by the knowledge media of the 21st Century.

It is well recognised that speculating about the future is highly methodologically challenging. As discussed in Section 2.3, Ong and McLuhan both issued warnings about attempts to consider new possibilities based on past perceptions. Ong (1977) described this as like trying to

peer into the future through the perceptual lens of the past. McLuhan (1994) warned that all interpretative research was perceptually fraught because it was like driving into the future using only the rear-view mirror. He (1969) used this analogy to explain that human consciousness is always attuned to interpreting the period prior, whereas an environment becomes fully visible only when it has been superseded by a new environment and so human perception is always one step behind in terms of reflections.

Another reason for McLuhan's (1994) argument that making assumptions about the future based on current trends is methodologically flawed is that transformational changes are not necessarily unidirectional, nor do they proceed on a straightforward progression, and nor are they necessarily positive. This research established that the emerging epistemological beliefs that are being mediated by increasingly digitised knowledge media are not progressing along a consistent developmental path. The analysis of the three comparators showed that, rather than developing along a smooth trajectory, there are indications that a major breach, revolution or 'paradigm shift' (Kuhn, 1962) in ways of knowing about the world is occurring (Lyotard, 1984; Ong, 2012; McLuhan, 1994; Pettitt, 2009). Goody (1977) described this as a 'rupture'. An example of this rupture is, as the analysis in Chapter 5 revealed, that the Carl (2010) knowledge medium comprised a wide range of flashy, highly colourful, visually sophisticated elements, whereas the Wikipedia knowledge medium of today (like Vernon's 1965 knowledge medium) relies primarily on text to mediate meaning. In this way, the Wikipedia knowledge medium does not fit neatly on a continuum, and provides a different sensory experience. This difficulty with establishing a meaningful continuum in fact illustrated a key point in this analysis.

While this research incorporated comparative, diachronic analysis into the methodology, the lens could be applied to individual knowledge media, which could be analysed as standalone rather than analysed comparatively.

6.4   The effectiveness of epistemological beliefs as a way of thinking about knowledge

From a philosophical perspective knowing and knowledge is an extensive and contested field of research. From an individual perspective coming to know is a complex, multifaceted experience. Consequently I needed to find some way of confining and framing the argument in this research. In order to do this I chose to apply the heuristic of epistemological beliefs (Schommer, 1990, 1993a, 1993b, latterly Schommer-Aikin, 2012).

From a methodological perspective one of the advantages of the framework of epistemological beliefs was that it provided a well researched, predeveloped grid for thinking about the core group of, generally unconscious, beliefs that individuals hold about knowledge. From a developmental perspective this framework can be seen as a series of incremental changes along three epistemological dimensions. The first dimension is based on unconscious perceptions of the duration of knowledge—the extent to which perceived truths remain true forever or are subject to change. The second dimension is concerned with the perceived structure of knowledge—the extent to which the field of sociology is perceived as complex with numerous interconnections, with a range of possible correct answers and with numerous possible ambiguities—as opposed to the extent to which sociology can be understood with complete certainty and consists of factual information that can be memorised as series of standalone concepts. The third epistemological dimension is concerned with the sources of knowledge: the extent to which knowledge is achieved through mastery of decontextualised facts located in the external world as opposed to achieved through the processes of reasoning.

One of the limitations of the use of the framework of epistemological beliefs was that, in focusing on three specific epistemological beliefs, other ways of knowing were excluded from the analysis. The research question did not call for discussion about alternative ways of knowing but, implicit in the findings, was the idea that there are other, equally important, ways of knowing but these are difficult to recognise and value. These excluded ways of knowing are very difficult to theorise—the rigid form of mass-printed knowledge media has perceptually ingrained post-Gutenberg, Western ways of knowing so deeply that they are difficult to counter without straying into new-age terminology.

Another problem with the heuristic of epistemological beliefs is that it makes major assumptions about knowledge values and directionality across genders, ages and cultures. This is a limitation of the lens because, for example, what are regarded as "sophisticated beliefs" in one culture are not similarly valued in another. There is extensive research still to be done about epistemological beliefs from more diverse perspectives but this research applies this model as a useful heuristic for interpreting epistemic perceptions. Further research is needed to develop more contextually and culturally refined approaches for analysing beliefs about knowledge, and new models of epistemic thinking.

One of the key issues that arose with the model of epistemological beliefs was that the findings showed that the knowledge beliefs being mediated by increasingly digitised knowledge media did not conform to Schommer's (1990, 1993a, 1993b, latterly Schommer-Aikin's, 2012) findings about what constitutes sophisticated sources of authority. From the perspective of epistemological beliefs sophisticated ways of knowing could be arrived at through a process of reductionism. In this respect the anticipated directionality of naïve to sophisticated ways of knowing did not apply. Rather than the knowledge seekers in the digital wiki knowledge environment finding authority in the rational processes of deduction, as theorised by Schommer-Aikin, there are indications that in the wiki knowledge environment knowledge seekers are trusting the sensory experience of others as a form of authority.

Despite these qualifications the three specific personal epistemological beliefs that were incorporated into the framework provided a useful heuristic for two reasons. First, they provided a perceptual tool for separating, theorising and analysing individual beliefs about knowledge and how knowledge is imagined to be. Secondly, the perspective of epistemological beliefs, allows some way, albeit somewhat simplified, of considering epistemological beliefs from a developmental perspective.

6.5   Summary of Chapter 6

Coming to know is a complex web of unconscious sensory experiences. This research developed a lens to show how the highly mechanised production and distribution processes, and the highly sedimented material composition of print based knowledge media have contributed to unconscious beliefs about knowledge. This lens was based on the idea that breaking down and comparing the modal strands of the material composition of individual knowledge media into the three diachronic axes of time, space and sound provided valuable information about the epistemological influence of the sensory environment.

Central to the question of the success of the methodology is the extent to which this methodological lens could be applied to other knowledge media. Although this lens was applied to only three examples of knowledge media the broader aim was to develop a lens that educationalists could apply to a wider range of knowledge media in order to subject them to epistemological scrutiny. There are numerous other examples of knowledge media such as seminars, lectures, online group sessions using Blackboard ™, for example, that could have been analysed. Each of these examples of knowledge media has their own unique modal

materiality. They are all examples of knowledge media that, when used repeatedly, deeply influence epistemological perspectives and subsequent pedagogical practices. Further strengths and weaknesses of this lens will not be revealed until the lens is applied to a more diverse range of knowledge media.

In summary Chapter 6 highlighted the methodological difficulties and limitations associated with this lens. Section 6.1 made the point that micro-analysing the modal composition of the medium provided a way of focusing on the modal elements of the three chosen comparators, even when these various elements were materially very different and, in the case of the Wikipedia medium, relatively materially evanescent. It made the point that the absence of particular modes is also highly significant in terms of sensory interpretation. Section 6.2 found that separating the sensory experience of knowing into the three sensory dimensions of time, space and sound (as based on McLuhan's (1994) idea of sensory extensions) provided an effective framework for differentiating and examining the sensory influence of each knowledge medium. The third section (6.3) discussed how diachronically comparing small, subtle sensory engagements with the modal elements of the medium was an effective strange making strategy when epistemological trajectories were smooth but that the material 'ruptures' were not accounted for in this approach. Section 6.4 concluded that the heuristic of epistemological beliefs was a useful framework for narrowing the epistemological focus but that elements of this framework were overgeneralised. Overall this lens has provided a valuable heuristic for thinking about how knowledge seekers' sensory engagement with the material composition of knowledge media is mediating specific beliefs about knowledge.

7   Finishing points

The research sought to address the broad question of how the medium by which knowledge is stored and shared shapes perceptions about knowledge. This question has two dimensions. First, it asks about the mechanism by which knowledge media (like the three examples chosen for analysis) influence personal beliefs about knowledge. Secondly, it seeks to understand the particular ways in which the medium by which knowledge is stored and shared influences beliefs about knowledge.

As discussed in Section 1.4, this research is directed at two primary audiences. This concluding chapter addresses both of these audiences. Section 7.1 reiterates the research question and summarises the findings. Section 7.2 is directed at theorists, particularly media ecologists. It discusses the primary contribution that this research has made to knowledge: a fine-grained methodological lens for analysing the epistemological influence of knowledge media. Section 7.3 is a call to teachers, educational managers and policy makers to be more conscious of how they choose and use knowledge media. Section 7.4 discusses future research directions. It outlines the initial steps in design of a rubric to make the methodological approach developed during the course of this research more practical and accessible for teachers and those who select knowledge media. Section 7.5 is a call for teachers, educational managers and policy makers to value orality (whether face-to-face or via social media) as a valuable medium for coming to know—a medium that has special epistemological affordances.

7.1   Summarising the findings

This research has confirmed what media ecologists, McLuhan (1962, 1996) and Ong (1977, 2012) in particular, had broadly predicted, and what most of us have suspected: changes are occurring in beliefs about knowledge, particularly how some knowledge is attributed greater value and validity over other knowledge. It has shown that these changes are, in part at least, a sensory response to changes in the material composition of the media by which knowledge is stored and shared, particularly as the processes of digitisation are influencing sensory engagement with knowledge media at all stages of their production, distribution and consumption cycles.

The primary focus of this research has been mass-printed knowledge media—the primary tools of Western pedagogy. Despite their lowly intellectual status (as discussed in Section 1.4),

mass-printed knowledge media have been the most perceptually significant knowledge medium since the Enlightenment and have deeply influenced normative beliefs about knowledge. This research has shown that their influence on epistemological beliefs has come about not only through their ideational content but also through the sensory experience of their material composition as this has refracted the flow of discourse.

The core question that this research has addressed is: how does the medium by which knowledge is stored and shared shape perceptions of knowledge? In order to address this, a fine-grained diachronic comparison of three examples of pedagogical knowledge media was undertaken along the three sensory axes or 'extensions' (McLuhan, 1994) of time, space and sound. The findings suggest that the material composition of mass-printed knowledge media has profoundly influenced epistemological beliefs since the Enlightenment, and that the increasing digitisation of knowledge media is subtly mediating a number of changes to epistemological beliefs.

In particular, the analysis in Chapter 5 showed that the material composition of the knowledge medium has influenced the degree, intensity and rapidity of communication through that medium. These variations to the flow of interactions are having a number of subtle and incremental influences on epistemological perception that are accumulating to form significant changes. They are influencing the extent to which knowledge is perceived to exist in terms of simplistic polarities such as true or false, and to be neutral and able to exist outside human bias; the extent to which coming to know is seen as a process of reductive segmenting and categorising; the extent to which face-to-face (or social) knowledge is seen as less valid than printed knowledge; the extent to which intellectual engagement with knowledge is perceived as a process of stepping back and separating self from the situation; the extent to which interpersonal and empathic forms of knowing are seen as marginal forms of knowing that are intellectually inferior to detached, more objective forms of knowledge; and finally the extent to which it is perceived as appropriate to tailor and simplify knowledge specifically for students.

The analysis in Section 3.3 and in Chapter 5 revealed that the processes of digitisation are mediating significant changes in the material composition of knowledge media at all stages of their production, distribution and consumption cycles. That knowledge is mediated by screens that look similar to pages, and that text is the primary medium of communication in the Wikibook example, can give the impression of 'business as usual' in terms of sensory engagement with knowledge media, but this is not the case. The analysis showed that the

printed page and the screen have different affordances and constraints, and are mediating different epistemological beliefs.

The analysis in Chapter 5 showed that the most significant sensory change occurring in the digitised environment is that coming to know is, to a much greater extent, a process of interpersonal engagement with the other or others who are mutually engaged in knowledge seeking. Instead of knowledge being experienced as representations of the world, the Wikibook knowledge medium is increasingly facilitating connectedness with others who are mutually engaged in knowledge "doings" (Ong, 2012, p. 43). It is increasingly valid for those engaged in the 'doing' of knowledge to reveal feelings and to show emotional commitment rather than simply gathering and disseminating information. The increasingly digitised knowledge medium is also mediating the idea that personal experience has validity as a form of authority.

Another aspect of this sensory change is that the increasingly rapid feedback loops that are a feature of the Wikibook knowledge medium are contributing to the sensory impression that knowing is a messy, dialogical, unfolding process rather than just an act of absorbing the finished product. The epistemological implication is that coming to know about the field of sociology (in this case) is increasingly being perceived as an active process—a verb—rather than an exercise of intellectual engagement with a pre-established body of knowledge. This can be seen in light of a return to valuing the debate and disputation of ideas, as associated with oral cultures, rather than the memorising of facts.

Seen in light of Schommer's (1990, 1993a, 1993b, latterly Schommer-Aikin's, 2012) epistemological beliefs, the digitised knowledge environment is increasingly mediating more constructivist beliefs about knowledge. The analysis has revealed that, overall, the less stable, less confining, more spontaneous material composition of digitised knowledge media is mediating more "sophisticated" (Schommer, 1993b) beliefs about knowledge.

While the move towards more sophisticated ways of knowing can be perceived as largely positive, the most important finding of this research is *not* the specific epistemological changes that are occurring as a result of the processes of digitisation. Instead, the key point is—as Kuhn (1962), Ong (1977a, 2004, 2012), McLuhan (1962, 1969, 1994), Postman (2005) and Wertsch (1991, 1998) have theorised—that knowledge media act in subtle ways by exerting deep sensory influences, difficult to detect, on teachers' and students' perceptions of what is believed to be valid and valuable knowledge. The problem is that this process and the increased

sophistication of knowledge beliefs are occurring unconsciously and largely serendipitously. The issue is that a number of highly influential changes in beliefs about knowledge are becoming culturally accepted beyond the awareness of those who are engaged in the knowledge construction process.

From a theoretical and pedagogical perspective this lack of conscious awareness of the mediating influence of knowledge media is not good enough. Therefore the following Section (7.2) outlines a fine-grained methodological lens for analysing and illuminating the epistemological influence of knowledge media, and Section 7.3 calls on teachers, educational managers and policy makers to be more mindful of the influence of the media that they choose and use in their pedagogical practice because emerging knowledge media, unless carefully chosen and considered, have the potential to shape unconscious perception in unexpected and possibly undesirable ways.

7.2   A lens for analysing knowledge media

As discussed in Chapter 6, the primary contribution that this research has made to knowledge is not the specific findings of the analysis that was carried out in Chapter 5. While the broad finding that material composition has considerable, unintended influence on meaning may be surprising to those who are not familiar with the field, amongst media ecologists it is axiomatic. The review of literature associated with media ecology (Sections 2.1, 2.2 and 2.3), and in particular the theorising of McLuhan (1962, 1994) and Ong (1977a, 2004, 2012), shows that the influence of material composition has been well recognised (Eisenstein, 2013; McLuhan, Poster, 1995, 1998; Postman, 2005; Ong). Hence the epistemological changes revealed in Chapter 5 were, overall, a confirmation of the ideas of these theorists rather than original research.

The primary aim of this research, and the original contribution that it has made to knowledge, is the development of a methodological lens that makes the subtle sensory influence of the "character of the medium" (McLuhan, 1994, p.9) of knowledge more discernible, so that the sensory influence of the knowledge medium can be closely examined and critiqued. This methodological lens is grounded in the theoretical field of media ecology. The key theoretical position that underpins this field is that knowing is primarily a sensory rather than intellectual experience. McLuhan's (1994) well-known phrase 'the medium is the message' is a pithy elucidation of this idea because it claims that there is a subtle flow of sensory experience that

runs underneath conscious notions of content, and that this subtle flow is the true influence of the medium.

Although the field of media ecology is rapidly gaining recognition (Strate, 2015) its claims about the sensory dominance of the medium of communication have been highly controversial. As discussed in Section 2.3, one of the key criticisms levelled at media ecology as a field of study is that it is not 'scientific' (McLuhan & McLuhan, 1988, p. ix) and that media ecology, as an intellectual school, shows a general disregard for methodology. Media ecologists, particularly McLuhan (1969, 1994) and Ong (1977a, 2004, 2012) have speculated about the epistemological changes that a digitised knowledge environment would bring, but (as discussed in Section 2.3 and in Chapter 6) they tended to take a macro-level approach to considering these changes. This research has developed a more applied methodological lens to examine the influence that sensory engagement with modal composition has on pedagogical media.

Detecting and analysing the sensory experience of knowledge was the primary methodological challenge faced in this research project. In order to achieve this I developed a methodology based on the recognition that all knowing, including knowing derived from interpersonal communication, has some degree of materiality. Central to this methodology was a fine-grained diachronic comparison of a range of unique material elements of three examples of knowledge media. These knowledge media were examined on a continuum from mass-printed knowledge media to digitised knowledge media. The material elements that were examined included the font size and type, the extent and style of images used in the medium, the feel of the knowledge medium (for example, whether the paper is dense or flimsy), the extent to which the feedback loops in the medium mediate controlled or spontaneous interaction, whether the voice of the author is directly acknowledged in the medium, the extent to which the content has been sequenced in a systemised order of headings and sub-headings, whether the content can be remediated into other formats and the extent to which locating mechanisms such as page numbers and indexing systems dictate the reader's flow of attention.

McLuhan (1994) theorised that sensory engagement with the epistemological environment occurs along three phenomenological axes or 'extensions' or: time, space and sound. These sensory extensions provided way of analysing the three knowledge media and comparing them on the same sensory level despite their material diversity. The first sensory dimension (time) provided a way of identifying and examining how the material composition of the medium mediated sensory perceptions about the stability or instability of the content. The second

sensory dimension (space) provided a way of identifying signs of epistemological complexity based on the extent to which the content is spatially contained within one stand-alone medium, the extent to which the content is pre-developed, and the extent to which the 'workings 'behind the development of the content are visible or invisible to the knowledge seeker.

The third sensory dimension (sound) examined the extent to which the knowledge media mediated the sensory experience of the voice of the other or others who were, or had been, to some degree, mutually engaged in the development of the medium. The phenomenological influence of the sound of the other on epistemological beliefs was analysed by observing the extent to which these knowledge interactions mediated any response or change in the others engaging with the medium. For example, the analysis considered the extent to which the absence of feedback loops in mass-printed texts privileged the thinking that is done by others, and how the one-sidedness of the feedback process positioned the reader as a passive consumer in the meaning-making process, and undermined opportunities for mutual composition and reaching mutually agreed understandings.

As a way of thinking about and narrowing down the large field of epistemology this research applied the heuristic of epistemological beliefs (Schommer, 1990, 1993a, 1993b; Schommer-Aikin, 2012). According to Schommer's research, personal beliefs about knowledge can be perceived along three dimensions. The first is based on the extent to which perceptions of knowledge range from highly certain to highly uncertain; the second is concerned with the extent to which knowledge is perceived as a collection of meaningless isolated facts or a series of interrelated concepts; and the third dimension is concerned with the extent to which knowledge comes from a text or is based in reason. These three dimensions of personal epistemological beliefs provided a heuristic for thinking the shift in perceptions of knowledge that are occurring as knowledge media become increasingly digitised.

The particular research methodology developed in this research involved diachronically comparing three examples of knowledge media across a time span of 50 years in order to detect ongoing change and emerging epistemological trajectories or ruptures. However, elements of this methodology could equally be used to analyse how the material composition of individual knowledge media, considered in isolation, influences the sensory experience of knowing. In other words this lens or methodology could be applied to any form of knowledge medium—be it a specific blog or mail list, a Ministry of Education commissioned classroom resource, a MOOC (a Massive Open Online Course), an academic journal, an interactive session between

participants using the Kahn academy, a verbal presentation or even an informal group discussion. More specific research possibilities associated with applying this methodology to other forms of knowledge media are considered further in Section 7.4.

7.3   A call for greater media awareness on the part of teachers

A number of prominent theorists have focused on the role that formal education plays in positively directing social change (Bernstein, 1996; Bourdieu & Passeron, 1990; Bruner, 1990; 1996; Dewey, 1938; Freire, 1998), but they have tended not to recognise the importance of the medium of communication. Wertsch (1991) argues that while it is widely recognised by these theorists that there are significant problems with the formal education system, attempts to solve these problems have been largely unsuccessful because those who are empowered to solve the problems (such as teachers, educational researchers and educational policy makers) have been looking in the wrong places for answers. They have tended to look into either the external socio-cultural environment (Bruner; Dewey, Freire) or into the minds of students (Piaget, 1994; Vygotsky, 1962). According to Wertsch, the place that they should be looking for answers is the material composition of the medium.

Vygotsky (1962) called the difference between what learners can achieve with and without assistance, the "zone of proximal development" (p. 86). Given the importance of epistemological beliefs in developing sophisticated ways of knowing about the world (see Section 1.3) and the significant influence of the material composition of pedagogical knowledge media on epistemological beliefs, it would be expected that the new knowledge media being rapidly incorporated into contemporary pedagogical practice would be carefully selected to support the process of bridging this "zone". This research has found that this is not the case. Section 3.3 indicated that contemporary pedagogical decision makers are still not mindful of the introduction of new technology from a media perspective. This is particularly concerning given that, as both Barnes and Strate (2014) and Postman (1994) argue, students are the most vulnerable audience.

As discussed in Section 3.3, and as supported in the analysis in Chapter 5, mass print has had a confining and limiting influence on beliefs about knowledge, particularly in Western educational settings where intellectual understanding has been mediated primarily through mass-printed text for almost 500 years. As revealed in the absence of relevant literature (Section 3.3), the profound influence of print as a medium that mediates perceptions about the

value and validity of some knowledge over other knowledge has not been particularly acknowledged or researched by teachers, academic managers or policy makers. Although educational reform and standards have been a topic of public debate for decades, the danger of implementing "unexplored technologies" (McLuhan, 1969, p.19) has been unrecognised by those responsible for shaping the classroom 'sensorium'. They seem unaware that their decisions about the use of textbooks, software and other media have significant noetic and epistemological implications.

The absence of research suggests that digitised knowledge media are slipping into pedagogical practice with little scrutiny of their influence, particularly on beliefs about knowledge. The research in Section 3.3 indicated that a number of forces are contributing to this uncritical adoption of digitised knowledge media: politicians perceive digital knowledge media as a visible indicator of the prestige or international standing of the national educational system; and parents are afraid that if their children do not engage with digital knowledge media they will be 'left behind'. Superficial forces such as price, fashion and presentation style have also contributed to choosing one medium over another. Furthermore, as was also established in Section 3.3, in the periods of both mass print and increasingly digitised knowledge media, teachers have had little influence over the design or choice of knowledge media.

The literature review revealed that teachers, academic managers and policy makers are not alone in their limited awareness of the influence of material composition on epistemological beliefs. As was discussed in Section 4.5, the subtle distortions in perceptions of knowledge were difficult to perceive in the period when mass print was the most visible knowledge medium because the mechanical processes associated with it normalised the knowledge conventions of the age and made thinking outside the 'trance' of literacy difficult (McLuhan, 1962, 1994). In other words, the perceptual influence of print has become so deeply engrained in consciousness that its power to influence perceptions about the value and validity of some knowledge over other knowledge is difficult for anyone (not just teachers and students) to perceive. This lack of awareness of the medium of knowledge has meant that the media of knowledge have "pushed us around" (McLuhan, p. 2) in a significant way.

An example of this 'pushing around' is the higher status awarded to knowledge associated with the STEM (science, technology, engineering and maths) subjects over knowledge associated with the humanities. From a media ecology perspective, a contributing factor to this higher status is that STEM knowledge is intellectually easier to perceive and assess, whereas the

knowledge associated with the social sciences is 'softer' and more difficult to define and measure. This emphasis on 'hard' knowledge is socially problematic because it is the humanistic (social science) knowledge that is associated with "sophisticated" (Schommer, 1993b) ways of knowing.

As discussed in Section 1.5, Ong's (1954) doctoral research into the teachings of Peter Ramus similarly revealed that the folk of the late 15th and early 16th centuries were not at all mindful when mass-printed knowledge media slipped into formal pedagogical practice and devalued long-established Aristotelian, dialogic, humanistic knowledge practices (Ong, 2004). Ong's research showed that those who rushed to incorporate mass-printed knowledge media into pedagogical practice were only able to perceive their affordances, such as their ability to shape knowledge into an easily accessible, highly standardised commodity. The properties of the new visual representations were embraced so enthusiastically that within a relatively short period the noetic influences of mass print came to be seen as entirely appropriate. Emerging digital knowledge media, unless carefully considered and selected, have the potential to shape perceptions in unconscious, unexpected and possibly undesirable ways.

The current period provides a particular opportunity to examine the influence that material composition has on epistemological beliefs because, as the literature in Section 3.2 indicated, this is a period of change equivalent to the disruption that occurred at the time of the adoption of the printing press (Barber et al., 2013; Chesser, 2011; Eisenstein, 2013; McLuhan, 1994; Ong, 2004, 2012; Poster, 1995; Postman, 1984). McLuhan wrote in 1994 that humankind is on the verge of being released from the "typographical trance" (p. 15) that it has been in for the past 500 years. At this time when digitised knowledge media are rapidly being incorporated into formal pedagogical practice, teachers, educational managers and policy makers have the opportunity to 'take charge' of their technologies by paying closer attention to the affordances and constraints of knowledge media and selecting them wisely.

Fortunately, as the discussion in Section 5.6 indicated, the increased incorporation of the processes of digitisation into pedagogical knowledge media is mediating a number of positive changes in epistemological beliefs. The less stable, less confining, more spontaneous material composition of digitised knowledge media is mediating more "sophisticated" (Schommer, 1993b) beliefs about knowledge, with digitised knowledge media being more attuned to constructivist beliefs about knowledge and constructivist pedagogical approaches, or at least not such an awkward fit.

The idea that the highly unstructured, informal knowledge that is mediated by interaction within an increasingly social knowledge environment such as the Wikibook's website could be perceived as rich knowledge-seeking practice is, to many, extremely challenging. It is mindfulness that is of critical importance. As McLuhan (1969) wrote: "The first and most vital step of all, as I said at the outset, is simply to understand media and its revolutionary effects on all psychic and social values and institutions. Understanding is half the battle. The central purpose of all my work is to convey this message, that by understanding media as they extend man, we gain a measure of control over them" (p. 20).

7.4   A call for future research—developing 'mindfulness'

Up till this point this research has been more interpretive than pedagogical. It has shown that knowledge media are highly and unconsciously influential, but that much more needs to be known about their influence on learning outcomes (taken in the broadest sense to include epistemological beliefs). It has reinforced Postman's (1995) claim that the casual adoption of new media without consideration of their deeper epistemological influences will inevitably have far-reaching and unexpected consequences.

Postman (2005) made the point that if a new form of knowledge medium is to be introduced into pedagogical practice its appropriateness must be assessed beyond the casual decisions based largely on marketing that were associated with the era of mass print so as "to keep our symbolic house in order" (p. 155). The stated research aim (and the primary contribution that this research has made to knowledge, as discussed in Section 7.2) was to provide a methodology to examine the unconscious perceptual influence of knowledge media on beliefs about knowledge. A more applied and pedagogically oriented goal that flows from this aim is the development of a framework or rubric to enable educationalists to choose and use knowledge media that contribute positively to developing more sophisticated beliefs about knowledge and, in turn, more humanistic ways of knowing about the world.

The analysis in Chapter 5 showed that the introduction of new forms of knowledge media are mediating a number of subtle epistemological changes in beliefs about the certainty, stability and sources of knowledge. If these changes continue along the trajectories established by this research then a significant change in focus away from curriculum frameworks and content standards is inevitable. These changes will inevitably raise a number of questions for pedagogical practice, particularly in the field of assessment. For example, if there are no longer

concrete, shared facts to be acquired, how will decisions be made about whether students have achieved mastery? How will teachers feel when students explore knowledge outside the boundaries of what is considered to be appropriate for the learning outcomes? Will teachers consider it 'fair' if students have access to different types of resources and amount of information? Would it be appropriate to allow students to operate outside a body of knowledge that has been tailored for pedagogical purposes, such as through conversations with a friend or knowledge obtained through a chat room? These questions signal a fundamental, large-scale epistemological shift that is at the heart of the implications of this research.

Educationalists urgently need a practical way to mindfully engage in the process of selecting or designing knowledge media that are aligned with constructivist epistemologies and pedagogical practices. This section outlines the beginnings of a rubric that would enable teachers and policy makers to choose knowledge media that are conducive to sophisticated beliefs about knowledge and constructivist pedagogies and have the potential to mediate more holistic, relational ways of knowing about the world. The thinking behind this rubric has arisen from this research and is included here as a potential future research project. It is in the early stages of development.

The rubric could consist of a series of questions or a graduated checklist. These questions could focus on the extent to which the medium involves the individual engagement and mastery of pre-developed content as opposed to encouraging knowledge seekers to meaningfully participate in the knowledge generation process, the extent to which the medium mediates the perception that knowledge is static as opposed to constantly unfolding, the extent to which the author's voice is present in the medium, the extent to which the medium makes it clear that a selection of knowledge has been included and why this particular selection was chosen and what has been omitted, the extent to which knowledge is presented as abstract or located in specific timeframes, the extent to which the medium facilitates engagement with primary sources, the extent to which the medium is concerned with presenting the final, carefully rhetorically crafted intentions of the author or reveals the workings behind the knowledge, whether the medium acknowledges the many and varied layers of contributions, how regularly and easily the content is updated, and whether the medium values knowledge that is derived, for example, from a friend or through a chat room.

The strength of this rubric would be that it could be applied to a wide range of materially diverse examples of different material forms of knowledge media such as a formal lecture, a

seminar, a reference encyclopaedia, the Kahn Academy website, an electronic whiteboard, a MOOC, a PowerPoint ™ presentation, a 'morning talk', a Google search or a conversation with others. Although the material composition of these types of knowledge media are materially diverse, they each have degrees of materiality along the material axes of time, space and sound, and these material axes can be used as a way of examining the degree of epistemological sophistication mediated by each medium.

A student-centred approach would need to be adopted in developing this rubric. In order to develop epistemologically appropriate knowledge media it is important that the rubric be based on a close analysis of the students' individual perception and individual sensory experience of knowledge media. For example, the implications of student engagement with specific knowledge media for their success and retention, and students' perceptions of their engagement with the knowledge medium. This data is difficult to gather. The ideal would be to incorporate data from technological devices that monitor the individual gaze, or software that tracks the length of time spent at various sites and the links, searches and hypertext choices made.

Had I conducted this research as recently as five years ago I may have looked to the publishing industry for insight into the future direction, form and influence of knowledge media. However, as Section 3.3 indicated, the market for structured, simplified knowledge media is changing dramatically.

From a media ecology perspective, formal knowledge media that are specifically produced for the consumption of students (or 'less cognitively able beings') are a construct of the market for commodified knowledge and are a product of the material cycles of knowledge production. As Williams (1983) pointed out, those types of work that make a loss will be reduced or discontinued and those types that make a profit will be expanded. The trends identified in this research present a challenge to the deeply established assumption that it is pedagogically appropriate for the content used by knowledge seekers in the formal education system to be systemised and simplified. From a media ecology viewpoint, when there is no longer a market for sanitised, cut down, didactic knowledge it will cease to be seen as appropriate for pedagogical consumption.

If the traditional pedagogical content industry continues to exert influence on the knowledge media market, then a number of practical questions about the influence of knowledge media on pedagogical outcomes need to be addressed. An important function of the rubric discussed

above would be to provide a lens to examine the validity of the promotional claims of educational publishers, content providers and software developers, and the extent to which their claims are aligned with the pedagogical and epistemological expectations of teachers and the epistemological experience of students.

However, if the trends identified in this research continue, then 'crowd-sourced' knowledge media such as Wikibooks will undermine the business viability of the publishing industry, and in time it will cease to produce content. The decommodification of knowledge is signalling an end to the traditional business model, but what is going to replace it is less clear. There appears to be a binding connection between a formal curriculum and structured content—while there is a curriculum there will always need to be some form of content. Will it be up to the education system to commission its own resources, or could they be crowd-sourced through knowledge media like Wikibooks? The epistemological implications of these changes in the source of content will be significant and are an important area of ongoing research.

7.5   A call to value orality—the invisible knowledge medium

This research has developed a methodological lens to encourage those who select and use pedagogical knowledge media to be more mindful of their implicit ontological power. From a media ecology perspective what is known about the world and how we know it are inseparable because sensory engagement with the world mediates every element of mankind's existence in the world. The shift from an oral culture to a literate culture affected consciousness at every level including man's sense of himself and his place in the cosmos.

The important ontological implication is that there is no single reality, that there are alternative ways of being that would be just as 'natural' under different sensory conditions, and that reality is a continuous process of changing sensory engagement. If the way we live in the world and think about the world is not 'natural', but rather a learned, evolutionary process mediated by sensory engagement (Ong, 1977a) then it is possible to have options and make decisions about how to better live in the world. This research has, on a broader level, developed a lens for considering these options by providing a tool for perceptually stepping outside the influence of mass-printed knowledge media in order to glimpse alternative epistemological possibilities, and for using pedagogical knowledge media that mediate more humanistic and sophisticated ways of knowing.

The research concludes with a call for educationalists to recognise the affordances of the medium of orality—both online and face-to-face—as a valuable medium for coming to know about the world. Ong (2012) theorised that oral, dialogic ways of knowing (such as conversation) have unique communicative and pedagogical affordances and the potential to enhance knowing in ways that are probably unachievable by any other medium. He argued (1977a, 2012) that the mutual presence of interlocutors, which is the primary sensory influence in oral ways of knowing, has special epistemological affordances as the "primordial attunement of one human existent to another" (1977, p. 8) and is intensely, experientially powerful. Ong further claimed (1977a, 1977b, 2012) that oral ways of knowing have the potential to mediate great depth of feeling, intense imaginative experiences, intuition and insight, and deep levels of self-reflection. He (1977a, 2012) believed that more interpersonal ways of knowing had the potential to bring about more harmonious and balanced worldviews.

The analysis in Chapter 5 indicated the emergence of a new emphasis on the auditory as a way of engaging with knowledge. However, the medium of interpersonal connectedness is not particularly recognised or valued by teachers. According to Ong, the reason that orality, as a medium of knowing, is perceived as artificial and often 'mere rhetoric' is because it has been devalued as a medium through being framed in terms of literacy (Ong, 1977a. 1977b). From a literate point of view, oral forms of sharing and storing of knowledge have become perceptually associated with the oral performance of literature, and thus orality is perceived as artificial and formulaic, associated more with superficial artifice such as enunciation, elocution and rhetorical (one to many) performance. Correspondingly, the social component of coming to know has not been particularly valued in the formal classroom context where such pedagogical practices are frequently dismissed as merely 'transmission teaching' and 'chalk and talk'.

What this research indicates (as previously forecast by Ong (2012)) is that the media of the emerging, increasingly digitised knowledge sensorium are not important because of their 'high-tech' features such as smart screens, mobile apps and other emerging Web 2.0 technologies—the places where 'cutting edge' educationalists have been looking so far. Rather than the 'gee-whiz' gadgetry, the pedagogical strength of digitised media lies in their enabling of the presence of the other person or people who are mutually engaged in coming to know. These changes provide an opportunity for a re-evaluation of what is perceived to be valuable and valid knowledge and for educationalists to choose media that mediate more sophisticated, more humanistic and more empathetic ways of knowing about the world, which value relational,

dialogic communication and cultivate the sense that knowing is always relative to the cultural and ethnic context.

Underneath the confining influence of mass print, coming to know has always been a process of human dialogue and human interaction—although the extended participatory time frame that operated when the technologies of the printing press dominated tended to disguise this flow of human engagement. Despite the fact (as discussed in Section 2.4) that all philosophical theories of knowledge and knowing assert that coming to know is a social process, the social, relational aspects of knowing were not particularly detectable in the Vernon (1965) or Carl (2010) knowledge media. According to Ong this is because orality, as a medium, has been hard to recognise—really hard (Anton, 2014), because its material composition is evanescent.

Despite its evanescent and fragile materiality, interpersonal communication (both online and face-to-face) has unique communication affordances that can enhance learning in ways that are probably unachievable by any other medium. This research calls for a re-evaluation of the pedagogical practices associated with the era of mass print and a recognition and valuing of the least visible and most powerful knowledge medium—each other.

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