A Qualitative Investigation into Experienced Educators' Responses to Professional Development Incorporating Contested Neuroscience

By

Jacqueline Elizabeth Elton

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I, Jacqueline Elizabeth Elton, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Jacqueline Elizabeth Elton

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Abstract

Brain-based education is promoted by its supporters as a teaching innovation that will enhance teachers' teaching effectiveness and support students' achievement, enjoyment and engagement in the learning process. Equally though, it attracts criticism from those who argue that since it has misappropriated science in unacceptable ways, its use exposes teachers and students to dubious theory and untested practices.

This inquiry was set within the context of a contemporary English local authority and a national education system characterised by a neo-liberal orientation. It capitalised on an opportunity to study how a particularly effective group of secondary practitioners responded in terms of their knowledge and practice to a range of brain-based models of practice, whose inclusion in professional development programme was aimed at improving teaching efficacy across the local authority.

The little empirical research on brain-based education that has been undertaken displayed gaps that equated to practice and knowledge issues. Accordingly, the research question formulated for this investigation was *How did professional development on brain-based education impact on the knowledge and practice of key secondary practitioners?* An interpretivist paradigm led to a qualitative approach. Data collection methods encompassed semi-structured interviews, documentary analysis and non-participant observation: thematic analysis was used as the data analysis method.

Key findings included that since their introduction, the use of brain-based models of practice had substantially declined. While practitioners continued to believe in the efficacy of brain-based education, many explained their brain-based practices in ways that did not accord with the original guidance or intent. Instead, the practitioners' implementation of brain-based models of practice exploited their non-neuroscientific teaching and learning affordances in creative and imaginative ways to provide solutions for pressing problems induced by neo-liberal policies. Despite demonstrating a poor understanding of brain science and brain-based education knowledge, the majority of practitioners rejected the acquisition of neuroscience knowledge.

(299 words)

Dedications

This thesis is for my husband, Chris, who has always allowed me to pursue my ambitions. It simply would not have happened without his unswerving support, encouragement and salient interjections of common sense.

I must also record my debt to my supervisor, Dr Trevor Male, who guided and supported me through this journey. He was instrumental on many occasions in dispelling the pervasive 'cognitive dissonance' thereby enabling me to eventually 'chip away the (many) bits of stone that weren't David'.

I also wish to extend my gratitude and thanks to the many important others who have helped and supported me, most notably Dr Ioanna Palaiologou, my original supervisor, Professor Peter Earley, my independent reader and of course, all the participants who willingly agreed to be interviewed and observed.

To my two teenagers, Lizzie and Andrew (especially the latter) as they embark on their own higher education adventures, on the topic of their frequently found amusement in the amount of time it has taken me to complete this thesis, I lay down this challenge: "Now it's your turn!"

Finally, my advice to anyone serious about doing a PhD is get yourself a pair of Great Danes … they make the most amazing and undemanding 'study-buddies'. The reassurance of merely seeing them snoozing away on the sofa like a pair of canine bookends kept me going on the many occasions I found myself mired in the 'cognitive swamp'.

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List of Abbreviations

Abbreviation	Name
AL	Accelerated Learning
AST	Advanced Skills Teacher
BL	Brain Laterality
B&A	Behaviour and Attendance
CT	Computerised Tomography
CPD	Continuing Professional Development
EBP	Evidence-Based Practice
EE	Enriched Environments
DCSF	Department for Children, Schools and Families
DfE	Department for Education
DfES	Department for Education and Skills
EEG	Electroencephalography
fMRI	functional Magnetic Resonance Imaging
GTP	Graduate Teacher Programme
IAL	International Alliance for Learning
ICT	Information and Communication Technology
ITT	Initial Teacher Training
KPI	Key Performance Indicator
L2L	Learn2Learn
LA	Local Authority
ME	Mozart Effect
MI	Multiple Intelligence
MM	Mind Mapping
NCSL	National College for School Leadership
NS	National Strategies
Ofsted	Office for Standards in Education, Children's Services, and Skills
PL	Personalised Learning
PD	Professional Development
QCA	Qualifications and Curriculum Agency
PET	Positron Emission Tomography
SIO	School Improvement Officer
SLT	School Leadership Team
SNS	Secondary National Strategies

SSAT	Specialist Schools and Academies Trust
TDA	Training and Development Agency for Schools
TEEP	Teacher Effectiveness and Enhancement Programme
TQ	Theoretical Questions
VAK	Visual, Auditory and Kinaesthetic Learning Styles
WBL	Whole Brain Learning

Chapter 1: **Introduction**

Dr Ben Goldacre is a journalist, an academic, medical doctor, best-selling author and, more recently a policy advisor to the government on evidence-based practice (EBP) in health and education. Since the millennium he has published extensively on the "uses and misuses of science and statistics by journalists, politicians, drug companies and quacks" (Goldacre, n.d., para.1). Goldacre's first book, *Bad Science* opens with this damming quote about the popular brain-based educational programme, Brain Gym®:

> Let me tell you how bad things have become. Children are routinely being taught - by their own teachers, in thousands of British state schools – that if they wiggle their head up and down it will increase blood flow to the frontal lobes, thus improving concentration; that rubbing their fingers together in a special sciencey [sic] way will improve 'energy flow' through the body … all part of a special exercise programme called 'Brain Gym'. We will devote some time to these beliefs and, more importantly, the buffoons in our education system who endorse them (Goldacre, 2008, p. ix).

In the book, Goldacre provides an equally scathing and sceptical treatment of many other purported examples of the misuse of science including homeopathy, medicine, nutrition, pharmaceuticals, and cosmetics. Correspondingly, Goldacre devotes special attention to those individuals, who, in his opinion, have no legitimate or credible scientific qualifications, but have represented themselves otherwise to profit from their particular alleged corruption of science. His concern about the misuse of science is not unique but he is amongst the relative few who do it in such a confrontational and high-profile way. Within education, a more nuanced instance of the misuse of science eliciting unease is that of *The Santiago Declaration*.

In 2007, a group of child development scientists became increasingly perturbed by what they perceived to be the abuse of their scientific research by the marketplace, policy makers and media. Banding together to publicly assert their ideas about the abuse of scientific findings with a view to challenging and raising awareness about these alleged wrongs, the scientists stated:

> Our research can provide guides in designing the most efficient means to policy ends ... Our research can also be abused in attempts to rationalize pre-conceived policies and popular notions about early childhood, putting science to a rhetorical and selective, rather than rational use ("The Santiago Declaration," 2007, para. 1-9).

Whilst the Santiago scientists were largely focusing on early childhood and Goldacre was specifically criticising Brain Gym®, both were highlighting different facets of the same problem. The problem being the alleged misuse of a specialised branch of science within education, namely that of neuroscience. Neuroscience is the study of brains and nervous systems, including their structure, function, and disorders (The Dana Foundation, 2016, p. 10). For clarification, I will use the words neuroscience and science interchangeably to mean neuroscience. The alleged misuse of neuroscientific research has a much wider educational footprint than just these two instances would suggest. Ostensibly, it is de facto represented by the 'field' called brain-based education. By mirroring the situation that modern medicine finds itself in *vis-a-vis* alternative medicine, brain-based education can be seen much like a complementary or fringe version of neuroeducation. This is because crucially and problematically, although often purported to be so, the theories underpinning brain-based education and its operational devices (i.e. its classroom models of practice) are ostensibly not predicated on correct or up to date neuroscience. Instead, brain-based education is fundamentally based on misappropriations of neuroscience (Ansari & Coch, 2006; Geake, 2008; Waterhouse, 2006). Nevertheless, it is claimed that brain-based education has apparently taken root astonishingly quickly (e.g. Goswami, 2006) because it has been ferociously devoured by teachers (e.g. Jorgenson, 2003). These comments typify the wider consensus in the academic discourse which hold that as brain-based education employs models of practice that are based on contested knowledge, it is a problematic endeavour that ideally should be eradicated (e.g. Pattern, 2011b). It is the putatively problematic phenomenon of brain-based education that this inquiry focuses on and it is set within the context of a local authority (LA) who were under severe duress from central government to improve student academic outcomes.

Chapter overview

I begin giving an account of how brain-based education was included in the professional development (PD) used by the LA central to this inquiry to develop teaching efficacy across its entire secondary school estate with the specific aim of improving student academic standards. This account underpins the presentation of my rationale for embarking on this inquiry that follows. I then introduce neuroeducation and explain how the neuroeducational construct of 'neuromyths' is inextricably but problematically bound-up with brain-based education. I then use VAK (Visual, Auditory and Kinaesthetic Learning Styles) theory as a typical operational device of brain-based education to show firstly how its underpinning (but putative) neuroscience is flawed and secondly, the typical implementation problems that it generated for educators who wished to use it in the classroom. Thereafter I formally introduce the research problem. I then revisit the background to the research briefly introduced earlier with the intention of setting out some dimensions of the atypicality of the research context and to outline some of the more important limitations of the inquiry. I then introduce the central and subsidiary/theoretical research questions. Before concluding the chapter with an overview of the main thesis, I document why the research inquiry is important.

Research rationale

I first encountered brain-based education working as a School Improvement Officer (SIO) delivering PD in an underperforming LA in the North of England. I have adopted the pseudonym of Westford for the city that it represented, and I use the term 'underperforming' in the context of anticipated success in student achievement as measured by standard national tests. The LA had missed national student achievement floor targets by some considerable margin for many years and languished at the bottom of the Department for Education's (DfE) published national primary and secondary educational performance tables. The focus of this research was secondary education and only one of the LA's cohort of maintained secondary schools was rated by the Office for Standards in Education, Children's Services, and Skills (Ofsted) to be 'outstanding'. Many Westford secondary schools were regularly ranked in the lower Ofsted categories meaning that they were subject to regular external interventions and, intense and permanent scrutiny. Consequently, Westford LA had been under considerable pressure from central government to improve this deficient performance in terms of student outcomes, particularly at Key Stage 4. The LA School Improvement Service was subjected to unremitting surveillance and intervention from central government's agencies on the ground. To describe the position of the LA as perilous would not have been an over-exaggeration. One strategic response to this situation from Westford LA's senior leadership team, notably the Head of Secondary Education, focused on improving the efficacy of Westford's secondary teaching workforce by adopting a proprietary educator PD programme. As I will argue later, this response – which made the development of educators' teaching practice, and knowledge about efficacious teaching behaviours central to its efforts to improve academic standards – was somewhat atypical for an LA to take.

The programme was called The Teacher Effectiveness and Enhancement Programme, but its acronym - TEEP – quickly became the adopted nomenclature for it in the authority. TEEP was introduced in Westford in 2005/2006, firstly with a small hand-picked group of science teachers, but then word quickly spread of its innovative and contemporary approach to improving classroom practice. Soon thereafter, the programme was fully adopted by the senior LA SIOs: Westford LA became a 'TEEP authority' and TEEP was officially pronounced as the teaching and learning mechanism by which secondary academic outcomes would be improved. The 'corporate' use of TEEP as a response to the government's scrutiny continued at least throughout the data collection period in Spring 2013 but as I was no longer involved with the LA beyond this time, I was however, unable to ascertain whether its use as a formal LA intervention continued after this period.

TEEP was originally a Gatsby Technical Education Programme. It was derived from an earlier Australian action research project, the Project for the Enhancement of Effective Learning (Loughran, 1999) and Maths Enhancement Primary Project (SSAT, n.d.) in 2002. TEEP purports to empower its practitioners with a practical, effective and cogent model for teaching and learning (TEEP, 2010). The architects of TEEP claimed to have discovered what research had been found to work and integrated this with what they considered to be best classroom practice into a PD programme. A series of commissioned reviews of impact which took place in the timeframe 2005-2016 were conducted by a succession of English universities and most latterly the Centre for the Use of Research and Evidence in Education. All reviews concurred with the efficacy of TEEP's model of practice as a school improvement tool. An early evaluation noted that "What seems clear is that TEEP represents a high quality CPD [Continuing Professional Development] experience soundly rooted in research of what is effective" (Ragbir-Day, Braund, Bennett, & Campbell, 2008, p. 86).

The PD programme comprises three levels. Level One lasted a total of five days and was the basic/introductory PD offered to all educators. In the approach adopted by Westford only the first few cohorts of attendees had their five days as one consecutive block and moreover, this PD took place in hotels, away from the school environment. Later the PD was divided into two shorter blocks, separated by a few weeks but conducted at LA/school premises. A portfolio was required to attend Level Two TEEP PD. The final progression was to Level Three where TEEP prepared practitioners to become TEEP trainers themselves. Completing Level Three led to 'certification', that is to say the attendees were formally recognised as official trainers by the TEEP organisation and authorised to deliver PD on its behalf. There was however, an apparent absence of quality assurance in this process, and certification seemed to be only conditional on full attendance over the three levels of PD. SSAT claimed that the "unique … 'model the model [sic]'" (SSAT, 2016, para.1) approach used in its delivery contributed to TEEP's popularity. A 'model-the-model' approach means that the PD is conducted using the same teaching strategies that the PD exhorts. According to SSAT this equated to TEEP "putting research on effective teaching for effective learning into practice. It supports teacher planning, motivates students and re-energises classroom activity" (SSAT, 2016, para. 1). A key feature of TEEP PD was that it was very proactive and dynamic. This was because the specific intents were firstly to give the attendees a non-vicarious learning experience that mimicked that of their students. The second reason was to enthuse them about the PD in order to inculcate optimum message adoption, subsequent internalisation and practice.

TEEP's model of practice is underpinned by a theory base which is divided into five separate parts, or 'elements' (TEEP, 2018). The TEEP literature states:

> The 5[sic] underpinning elements of TEEP are the part of the TEEP model that supports teachers to present a relevant and purposeful curriculum to their students … The elements act as the conduit between what the teacher, and the learner, has to do … and … the teaching and learning behaviours they will employ. The strategies and techniques stimulated by the 5 [sic] elements help the teachers teach effectively and the learners learn effectively. It is where theory and practice merge for the benefit of student learning (TEEP, 2013, p. 3).

The five elements are *Thinking for Learning, Assessment for Learning, Collaborative Problem Solving, Effective Use of Information and Communication Technology (ICT)* and *Accelerated Learning*. Whilst the first four elements are based on relatively uncontested educational theory, Accelerated Learning is not. Rather, Accelerated Learning is an embodiment of contested neuroscience knowledge and as thus comes under the wider remit of brain-based education. Since it forms a substantive aspect of this study, the construct of Accelerated Learning will be explored later, but for now it should suffice to say that it purports to be able to accelerate student motivation and achievement through the mobilisation of brain research findings (Smith, 2003).

After completing the full TEEP PD programme I acquired the status of an 'accredited trainer'. I then worked with Westford's TEEP SIO over several months in the capacity of co-trainer. However, I did not wish to compromise myself intellectually in front of my trainees by having a poor working understanding of TEEP's brain-based component. Consequently, I undertook some research to supplement my existing knowledge of its methods, ideas, and practices to avoid this eventuality. Very rapidly, my basic exploration of the scholarly literature on Accelerated Learning and brain-based education revealed a lot of 'noise'. Without question, Accelerated Learning and brain-based education were stirring almost exclusively pejorative reactions from the presenting array of academic commentators. The general tenor was that brain-based education (and Accelerated Learning) was a model of practice based on inaccurate and invalid neuroscience, and its practitioners attracted the same degree of disapproval. Without intending to, what I had started to uncover was the tension and disconnect that exists between the fields of neuroeducation i.e. the academic commentators, and brain-based education: the relevance of this to my inquiry is taken up later.

My scientific background meant that I found myself in agreement with the opinions of the Santiago scientists and Goldacre although truthfully, my sentiments aligned themselves more with Goldacre rather than those of the more reserved Santiago scientists. I thought that educators were being taken advantage of by what I perceived to be unscrupulous designers and purveyors of brain-based education. Equally, I was alarmed that by adopting it, educators were accepting brain-based education as uncontested knowledge. I felt sure that if educators only knew that they were being deceived and knew that the premise of brain-based education was largely unscientific they would quickly cease and desist from using it. As an SIO with responsibility for knowing about and promoting best/good teaching practice to others, I was especially concerned that the TEEP PD programme being used by the LA was based on the false premise that its brain-based component had scientific credibility. Thus, with my curiosity and irritation levels piqued, I embarked upon this research endeavour.

As an experienced practitioner working in the performative culture that characterises today's English schooling system and, fascinated with the part that effective teaching plays in the actualisation of school improvement goals, I was already keenly interested in how the academic and scientific communities seek to inform and better the knowledge and practice of people like myself. Equally, I was curious about how findings from science and social science are received, processed, and mobilised (or not) by educators. It seemed to me that, driven by the managerialist, marketist and performativity policy technologies that pervade English schooling (Ball, 2003), the TEEP programme that Westford had chosen to implement was in fact a naturally occurring intervention into practitioner knowledge and practice. Moreover, the intervention was itself atypical in that it was, in part, based on contested science. Because of the pejorative way brain-based education was portrayed in the scholarly literature, I was concerned by the LA's apparently unquestioning adoption of brain-based educational knowledge. This worry extended to its passing off to Westford's educators along with the rest of TEEP theory as the latest in teaching and best practice, in short, what they should aspire to implement. I was concerned that practitioners had fallen victim to a 'squeezed hierarchy' looking for the metaphorical 'snake oil' or indeed, the ultimate "elixir for an educational ill" (Male, personal communication, October 20, 2016). For the most part, and certainly on the many PD courses that I attended, the TEEP message, including the Accelerated Learning part of it, was positively received by attendees; on the face of it, the practitioners seemed to be complicit in the unwitting adoption of potentially unsafe knowledge and practices. I suspected that there was potential for new and insightful research on how educators, situated in the neoteric "devolved environment" (OECD, 1995, p. 74) fashioned by the influences and actions of performativity, managerialism and marketisation forces (Ball, 2003) interacted with contested knowledge. I next introduce neuroeducation.

Introducing neuroeducation

The perceived benefits of an education system informed by neuroscience do not in fact belong to the contemporary epoch. For the earliest purported attempt at the integration of education and neuroscience one must travel back to the Napoleonic era (Théodoridou & Triarhou, 2009). The Victorian period also witnessed a notable number of endeavours, but these were also largely unsuccessful, as were the efforts that transpired in the ensuing 100 years. Towards the end of the 1990's scientific and engineering know-how and capabilities had finally advanced to the point where the meaningful study of human living brains became possible. From the latter quarter of the twentieth century, sophisticated non-invasive techniques such as computerised tomography (CT) scans have facilitated the in-vivo investigation of human brain anatomy. Techniques such as Positron Emission Tomography (PET), functional Magnetic Resonance Imaging (fMRI) and electroencephalography (EEG) have allowed scientists to "see the brain in action" and thus rendering the neural correlates of cognition, emotion, and behaviour studiable (Lokhorst, 2007, p.3). The development and simultaneous widespread dispersion of these state-of-the-art technologies have been the enablers that have at long last allowed the separate and "disparate fields of research and various arenas of practice" (Stein & Fischer, 2011, p. 56) that constitute neuroscience and education to coalesce into the tentative and embryonic field of neuroeducation (Goswami & Szűcs, 2011; Szűcs & Goswami, 2007). There are other names in circulation to describe this new field, for example, Mind, Brain and Education (e.g. Fischer et al., 2007), Educational Neuroscience (e.g. Beauchamp & Beauchamp, 2012) but after Bruer (2008) I adopt neuroeducation throughout this thesis.

The contemporary consensus amongst those who have been called "thought leaders" (Tokuhama-Espinosa, 2008, p. ii) is that the *Decade of the Brain* (1990-2000) whose main purpose was to, as President George W. Bush proclaimed, "enhance public awareness of the benefits of brain research" (Library of Congress, 2000, para. 6), was a fundamentally important milestone in the creation of the new field (Jones & Mendell, 1999). Despite the success of the *Decade of the Brain* in gaining an enhanced understanding of basic brain control mechanisms, "a fundamental understanding of how the brain gives rise to the mind [was] still lacking" (Albus et al., 2007, p. 1321). Calls for the *Decade of the Mind* ensued (Sullivan, 2014) with neuroscientists being encouraged to "turn their attention and a powerful arsenal of methods towards what traditionally were regarded as 'mind-functions'" (Spitzer, 2008, p. 1). To some extent, straddling both 'decades' and their aims, a notable advancement in neuroeducation was brought about by the OECD's Learning Sciences and Brain Research project whose purpose was to use neuroscience to better understand learning and that new educational policy and practice reflect this knowledge. Phase 1 (1999 – 2002) scoped out those areas of brain research considered to be relevant to education. The OECD concluded these were literacy, numeracy, lifelong learning, and emotions (OECD, 2002). The second phase (2002 – 2007) extended the explorations of these topics to identify implications for policy and practice (OECD, 2007). Academics agree that the field is both neoteric and fast-growing (Ansari, Coch, & De Smedt, 2011). Furthermore, the neophyte field has, it is claimed, a substantial legacy from cognitive neuroscience, itself an emergent field (Ansari et al., 2011).

The term neuromyth became embedded in the lexicon of neuroeducation when the OECD drew attention to what it saw as the unfortunate array of scientific misconceptions abound in the public psyche at that time. In an interim report on their Learning Sciences and Brain Research project (1999 – 2007), the OECD first defined a neuromyth as "A misconception generated by a misunderstanding, a misreading or a misquoting of facts scientifically established by (brain research) to make a case for use of brain research, in education" (OECD, 2002, p. 111). Further clarification on the scientific underpinning, or otherwise, of neuromyths followed when the project concluded. For the OECD, neuromyths arise from findings or "results … that are, however, either misunderstood, incomplete, exaggerated, or extrapolated beyond the evidence, or indeed all of these at once" (OECD, 2007, p. 124). Amongst neuroeducationalists, this conceptualisation has been expanded even further to include any oversimplification, misinterpretation and/or belief in claims that are unsubstantiated or go beyond what the evidence supports (Alferink & Farmer-Dougan, 2010; Della Chiesa, Christoph, & Hinton, 2009).

The 2002 OECD report considered the most embedded neuromyths to include those of Brain Laterality (Left Brain/Right Brain), Critical Periods and Enriched Environments. The 2007 OECD report refreshed the list to include VAK theory, the 10 per cent Myth and the Myth of Bilingualism. Within neuroeducation there is broad concurrence with the OECD's choice of neuromyths. Given their use of contested neuroscience findings, there is also a substantial argument that The Mozart Effect, Multiple Intelligence theory and Brain Gym® should be recognised as additional neuromyths. As noted previously, the prevalence of neuromyths within education as manifested by brain-based education deeply disturbs many academics (e.g. Fischer, 2009; Goswami, 2006; Hruby, 2011) and organisations (e.g. OECD, 2002; 2007). These neuromyths will be fully explored later since they are central to brain-based education and thus to this inquiry.

Operationalising brain-based education

As stated, Accelerated Learning, as one of TEEP's underpinning tenets, is the specific brain-based methodology that this research focuses on. An example of a standalone teaching strategy featured in Accelerated Learning is VAK theory. I have chosen to introduce an example of an operational device at this early point in the thesis for two reasons. Firstly, to illustrate how in this case, VAK theory's underpinning but claimed neuroscience is flawed and secondly, to outline the typical implementation problems that brain-based education generated for educators wishing to practise it in classroom settings.

VAK theory is an operational device that is based on what has been called the "meshing hypothesis" (Pashler, McDaniel, Rohrer, & Bjork, 2008, p. 105). Pashler et al. (2008) contend that the meshing hypothesis - the claim that presentation should mesh with the learner's own proclivities - is a specific instance of the learning-styles hypothesis. The learning-styles hypothesis is that for any proposed learning-style theory individuals can be allocated to one of its learning-style categories. This is typically done through putative psychometric testing. Consequently, the fundamental idea communicated to educators is that the mode of instruction for each student should be matched - or meshed - directly to the students' 'diagnosed' learning preference. This is because apparently only this model of practice optimises their learning and thus maximises outcomes. For VAK theory, students are profiled using a learning styles inventory, for example the Barsch Learning Style Inventory (Barsch, 1991). Ordinarily, such inventories are not scientific. For example, Lafontaine and Lessoil's (2002) inventory asks questions like "Are you the kind of person who lives to eat?" and "Do you like to play sports alone?" (p. 7). The purpose of any VAK inventory is to determine the 'modality dominance' construct. The modality dominance is which mode of information receipt – from visual, auditory or kinaesthetic – a subject is dominant in (Pashler et al., 2008).

Implementing VAK theory's model of practice in the classroom would require teaching students whose putative modality dominance is visual, only using visual approaches. This would entail using exclusively pictures, displays, drawings, maps, and other visual resources. Contemporaneously, separate instruction only in the auditory format would be provided for auditory learners. Hands-on learning experiences would be the only mode of teaching deployed for kinaesthetic students. As suggested, what is important to note here is that using this model of practice is highly challenging, if not impossible in a typical classroom situation. Briefly, the contested science that gives genesis to VAK theory rests on the false premise that there are three dominant forms of mental processing: visual (sight, mental imagery), auditory (sound, speech) and kinaesthetic (touch, temperature, pressure and also emotion) (Geake, 2008). Accelerated Learning subsumes many more brain-based teaching strategies/methodologies and I explore these in Chapter 2.

Having indicatively outlined how brain-based education manifests itself and exemplified, using VAK theory, the problematic nature of its operationalisation by educators as well as introducing the concept of a neuromyth to suggest its flawed neuroscientific foundations, I next define the nature of the research problem that underpins this inquiry.

Introducing the research problem

It is claimed that the purveyors and architects of brain-based education have grossly and intentionally subjected educators to misapplied neuroscience as represented by brain-based education (e.g. Bruer, 1999; Varma, McCandliss, & Schwartz, 2008). Consequently, there is a pervasive assumption that large numbers of educators have adopted the operational devices of brain-based education believing incorrectly it would seem, that they are using uncontested knowledge. Such assertions generate calls for the eradication of brain-based education altogether (e.g. Pattern 2011b). Jensen, who is perhaps the 'father' of the brain-based movement disagrees (Krummick, 2009). Rather, he contends that brain-based education has performed a valuable service for the teaching profession, by improving teaching capability through its delivery and its promotion of an enhanced understanding of brain function (Jensen, 2008b). Such counter-claims attract many supporters within the brain-based education community (e.g. Arzy-Mitchell, 2013; Denton, 2010; Martin, 2006).

The discussion to this point leads me to conclude that brain-based education is a phenomenon that is worthy of scholarly investigation on its own merits, rather than merely as a "wrong" or "loose" version of neuroeducation (Dekker et al., 2012, p. 1) as it is currently typically characterised. I am not alone. Indeed, Geake (2008) signalled that:

> The generation of such neuromythologies and possible reasons for their widespread acceptance has become a matter of investigation itself … the phenomenon of their widespread and largely uncritical acceptance in education raises several questions; why has this happened? (p. 124).

However, it seems that Geake's call has gone largely unheeded as the phenomenon of brain-based education is to date relatively uncharted in terms of reliable research. To rectify this situation is ostensibly the purpose of this inquiry.

Atypical research context

This research endeavour is set within an atypical context for two reasons. One dimension of atypicality is that the LA invested a huge amount of political and social capital and finance into developing its educators' teaching to bring about the improvements needed in terms of the learning outcomes of its secondary students. In the 'self-improving system' that embraces the entirety of English schooling in the 21st Century, the responsibility for building teachers' teaching capacities is typically assumed to lie with the schools or the educators themselves (DfE, 2010). Local Authorities no longer tend to intervene in such matters on such a scale and financial footing. Westford LA's decision to use TEEP looks to have been based on the expectation that they were employing a theory base that had credibility. I will argue however that the LA was falling prey to fake claims because the scientific basis of Accelerated Learning is denied by the neuroeducational community. What is of consequence here, is that this debate appears to have been overlooked by the LA, who instead took the claimed theoretical basis of TEEP at face value. In fact, it appeared that Westford LA did not undertake due diligence on the theoretical base of TEEP because during subsequent PD all five underpinning theoretical tenets of the approach were presented as having equal legitimacy and validity.

The second dimension of atypicality comes about because through the vehicle of TEEP, Westford's entire cohort of secondary school educators were exposed to contested theory. The unusual Westford TEEP initiative is therefore an example of a naturally occurring, large scale, sustained intervention seeking to improve educator teaching efficacy. Accordingly, within the context of a contemporary, English secondary school setting, it offers perhaps an unrivalled opportunity to study educators' responses to this phenomenon of contested theory in terms of its impact on the two constructs that emerged from the review of the evidence i.e. their knowledge and practice.

Setting out the limitations of the study, this research only looked at the ways in which educators responded to the LA's use of brain-based education knowledge, as exemplified by Accelerated Learning, to improve secondary learners' (i.e. students) academic outcomes. It is not a study into the efficacy of TEEP, or a study of how the remaining uncontested theory base of TEEP was mobilised by educators, or indeed a study into the uncritical adoption of Accelerated Learning by Westford's School Improvement Service. Although the two constructs of knowledge and practice do form two of the major pillars of professionalism (Hoyle, 1974), neither is it a study into the professionality of Westford's educators. By the same token, it is not an inquiry into the PD or professional learning of the practitioners. This research endeavours specifically and exclusively to explore what the effect the 'formal' exposure to contested knowledge and theory had on the knowledge and practice of Westford's secondary-phase educators. Moreover, as I will explain and justify later, it is an inquiry focused on a specific demographic within the educator population that I call 'practitioners'. My working definition of practitioners for the moment is that they are teachers and LA personnel that are acknowledged as having influence in matters of teaching within Westford's secondary school estate.

Research questions

In Chapter 4 I show that there are gaps in our understanding of contested knowledge and theory as it relates to educators' use of brain-based education and these equate to first knowledge issues and secondly, to practice issues. Thus, in the context briefly outlined, the central research question in this inquiry asks:

What was the impact of a brain-based education component of a professional development programme on the knowledge and practice of secondary practitioners?

This central research question generated five sub-questions: these are shown in Figure 1.1.

Sub-questions
1. What understanding do secondary school practitioners have of brain-based education and its main teaching strategies/methodologies?
2. Was TEEP PD the principal source of this knowledge?
3. What brain-based teaching strategies/methodologies, if any, are used by secondary school practitioners and has this practice changed over time?
4. How are brain-based teaching strategies/methodologies used by secondary school practitioners?
5. Why do or don't secondary school practitioners use brain-based teaching strategies/methodologies?

Figure 1.1: The five sub-questions for this inquiry

Importance of the inquiry

This research aims to dismantle systematically what appear to be outdated, simplistic and unfounded, yet dominant notions about why and how brain-based education is and was used by educators. It is intended to provide new and helpful insights into this phenomenon which previously has only ever been conceptualised within a closed narrative that precludes any other interpretation than that which owes its allegiance to positivism and as I argue, scientism (an idealisation of science). Rather, it seeks to understand from the perspective of those who lead on teaching in an LA struggling with academic standards within the broader context of an educational system dominated by the doctrines and directives of neo-liberalism, the impact of PD on brain-based models of practice has had on their knowledge and practice. By accepting and indeed embracing context unlike any other study to date, this research reveals how the nature of contemporary educational settings and the concomitant mandated requirements and burdens placed on educators has directed their response to brain-based education. Accordingly, the findings of this study offer new and nuanced insights into educators' engagements with contested theory that was officially presented to them as quite the opposite.

Alongside de-pathologising brain-based education, at least pedagogically if not epistemologically, I put forward the case for practitioners' prowess at being able to 'solution-eer' problems and exert criticality. My findings challenge the imposed truth that educators are looking for superficial and localised 'magic bullets' or 'quick fixes'. Rather, it seems they are on a quest for an altogether more comprehensive and enduring solution. Impelled by their seemingly indefatigable optimism in the quest for the metaphorical Holy Grail of teaching, the practitioners became pedagogically promiscuous, willing to overlook the unscientific basis of new models of practice but only if they offered a prospect of success. For them, the key metric of success was improved student academic outcomes. Further findings support the existence of a type of practitioner criticality that was manifested in a practical manner through deeds and actions in the classroom rather than a priori deliberations, in other words, authentic, powerful but situated criticality where what counted was what was measured by the system. Practitioners exploited the affordances of the examined brain-based operational devices by enacting heuristic and creative adaptations to their functionality. Consequently, the original design intentions of the operational devices were completely bypassed. Ultimately, only two things united the variants of the operational devices that were subsequently deployed, their efficacy (in producing improved products and performances) and their original name. In short, brain-based education serendipitously and conveniently provided practitioners with the 'materiel' (i.e. campaign materials and equipment) with which to both comply with and resist the central policy directives and initiatives that involuntarily coupled them to their desired role in the neo-liberal environment that has become normalised within English education.

To conclude, the qualitative nature of this research makes it *sui generis*. Its importance derives from its provision of sufficient, good quality data to argue that at least in Westford, brain-based education should be reconceptualised as an intentionally appropriated rather than a misappropriated instrument. Brain-based education and its stable of fake neuro-operational devices were knowingly and purposefully employed by educators to meet a panoply of diverse needs and wants that were ostensibly the product of the wider reform-driven public policy domain. Brain-based education replete with its ambiguity and artificialness served to bridge a pedagogical liminal space for practitioners in the sense that it facilitated a movement from 'problems' to 'solutions'. I suggest that the overarching importance of this study is that much like brain-based education, it is a usurper of existing neuroeducational tropes, but more than that, it is an antidote to wider contemporary trenchant motifs that paint education as a site plagued by myths and potentially render educators as victims. In sum, in the context of an examination of what educators did with models of practice based on contested science, by using a qualitative approach "to obtain a description of the lifeworld of the interviewee with respect to interpreting the meaning of the described phenomena" (Kvale, 1996, p. 5) this research has opened up new ways of looking at teaching and educators' responses.

Thesis outline

The overall structure of the thesis takes the form of ten chapters, including this introductory chapter. Chapters 2, 3 and 4 are the conceptual framework chapters. Chapter 2 considers the key vocabulary, models of practice and history of brain-based education. It also documents opinions across the two sides of the 'Love it/Hate it' divide. Chapter 3 is home to the theoretical literature that describes and explains what I later call the 'operational environment' of Westford practitioners. Chapter 4 is the empirical literature chapter and it begins with an outline of the search strategy adopted. This is followed by an examination of the research relating to educators' knowledge and practice of brain-based education. Chapter 4 concludes with a rationale for the research questions and the 'in-principle' research design. Chapter 5 makes the case for the research methodology adopted for the project considering an interpretivist framework and the demands of the conceptual framework as developed in Chapters 2- 4. The specific qualitative research methods used (semi-structured interviews, non-participant observation and documentary scrutiny) are presented in Chapter 6. The data analysis technique of thematic analysis is justified and explained in Chapter 7. The analysed data findings presented as five themes are explored in Chapter 8. Following on, within the context of the conceptual framework, Chapter 9 presents the results of the interpretation phase. Finally, Chapter 10 answers the central and theoretical research questions. It also contains a review of the limitations and one final reflexive account.

Chapter 2: **Conceptual Framework: Theoretical Literature: Brain-based Education**

There are three chapters devoted to the conceptual framework that underpins the data interpretation and synthesis of findings presented in Chapter 9. This first chapter (Chapter 2) provides a critical synopsis of the theoretical literature relevant to the field of brain-based education and its use as a model of practice by educators. Chapter 3 replicates the analytical process for that theoretical literature which enables me to meaningfully describe and explain the operational context of Westford's practitioners. Chapter 4 documents the empirical literature as it relates to use of brain-based education as a model of practice by educators.

Chapter overview

I commence the chapter with an exploration of the historically influential operational devices of brain-based education. Thereafter, I propose a typology for brain-based operational devices and clarify terminology. Next, I foreground Accelerated Learning as the specific manifestation of brain-based education implicated in this inquiry. Subsequently, I consider the specific operational devices that are subsumed within Westford's TEEP variant of Accelerated Learning. In the ensuing sub-section *Disciplinary issues,* I examine the 'names and aims' of brain-based education. Using the heading *Love it or hate it!* the chapter next develops the two oppositional opinions of brain-based education. Finally, I use the summary to bridge forward to the following chapter by arguing that any real, rich and insightful understanding of educators' responses to and enactment of brain-based education can only occur when the context of their actual teaching environment is fully considered.

Historically influential operational devices

Serious although unsuccessful efforts to harness neuroscientific knowledge in the service of an 'improved' educational offering to children first began about 100 years ago (Théodoridou & Triarhou, 2009). In the middle of the twentieth century some of these allegedly less scientific pursuits matured into the mainstream. Brain-based education ostensibly originated in Bulgaria in the mid-1960s with Dr Georgi Lozanov's Suggestology (or Suggestopedia) (McKeon, 1995). Lozanov conceptualised Suggestology as:

> a science for developing different non-manipulative and non-hypnotic methods for teaching/learning of … subjects for every age-group on the level of reserve (potential, unused) capacities of the brain/mind. That means: at

> least three to five times faster, easier and deeper learning; inner freedom; increasing the motivation for learning; joyful learning and … well-being (Lozanov, n.d.).

Suggestology was hailed by the United Nations' Educational, Scientific and Cultural Organization (UNESCO) as a "superior teaching methodology" (LeHecka, 2002, p. 5).

Simply stated, it involves the "simultaneous activation of concentration and relaxation, logic and emotion, both brain hemispheres and conscious and unconscious processes" (LeHecka, 2002, p. 5). In the classroom, enactment requires the provision of a rich sensory learning environment including pictures, colour and music, a positive expectation of success, an emphasis on the understanding the whole before focusing on details, and the use of a varied range of teaching methods including acting, active participation in songs, games and storytelling (Hagiwara, 2004; LeHecka, 2002). During the mid-1970's in the United States, Suggestology formed the basis of Accelerated Learning (LeHecka, 2002; Lew, 2002). The literature holds a substantial discourse on the main brain-based operational devices that have at various times, been influential in the field of brain-based education and this includes Accelerated Learning. Table 2.1 presents a chronological summary of this discourse, excluding Accelerated Learning which I reserve for a detailed examination later.

Table 2.1: Summary of the most influential brain-based operational devices

Architect and main theory	**Key Claims**	**Indicative implications for practice**
Hart; Proster Theory (1975).	Existing teaching methods are brain antagonistic. "Present failure can be virtually eliminated" (Hart, 1981, p. 445). The brain behaves like a program and is at its best when dealing with patterns and searching for meaning.	Remove threat, emphasise communications and reality experiences (Della Neve, 1985).

Architect and main theory	Key Claims	Indicative implications for practice
Caine and Caine; 12 Principles of Brain-Based Learning (1990, 1991).	"Help[s] guide and foster effective teaching practices and help students reach higher standards of learning" (Ridley, 2012, p. 45). The three main principles of brain function are organised in groups; relaxed alertness, active processing of experience, and orchestrated immersion in complex experience (Caine & Caine, 1991).	Field trips, role-play, group activities, physical movement, emotional engagement, enriched environments that include vivid and colourful images to grab the students' attention (Hutchins, 2009).
Jensen; Brain-based Super Teaching Strategies (1995).	There are five stages of optimal learning anchored in neuroscience: Preparation, Acquisition, Elaboration, Memory Formation and Functional Integration (Krummick, 2009).	Change seating regularly to keep the brain curious, use multiple intelligences, provide choice for the learner because the brain learns many ways at once, pace learning because this allows the brain to make use of its function of survival. Provide natural lighting, walls painted in pastel colours, music, and lots of eye contact.

I next discuss the typology and terminology for brain-based education that I adopt in this thesis.

Typology and terminology

At the time of data collection, there was no prevailing typology of the operational devices of brain-based education, although the guide to the role of neuroscience in brain-based products by Sylvan and Christodoulou (2010) has initial utility in that it starts the work on a classification of brain-based "learning theories, principles, and products" (p. 1). Problematically though, it does not represent or develop the way in which the operational devices of brain-based education are related to each other. Rather, Sylvan and Christodoulou's four-point classification system is based on the role that neuroscience plays in brain-based products as a putative precursor to supporting educators' evaluations of them. Consequently, I propose a simple typology: I argue that there are two types of operational device (or models of practice) in brain-based education: standalone brain-based teaching strategies and brain-based teaching methodologies. Standalone brain-based teaching strategies are centred mostly on one piece of contested science/neuromyth and when multiples of these are integrated, they form a 'super-teaching theory'. I term the latter brain-based methodologies. In this instance, the concept of methodology refers to a set of methods, rules, or ideas that are important in a science or art. Collectively, the individual standalone brain-based teaching strategies, become a set of methods or ideas that have greater importance and utility. As the name implies, there is a learning dimension inherent in all these strategies/methodologies. As the subjects of my research are educators rather than students, I limit my focus to the teaching aspects of brain-based education. I use the term operational devices and teaching strategies/methodologies interchangeably to mean the same thing: the same applies to my use of the three phrases, teaching strategies, teaching approaches and models of practice. Likewise, the phrase brain-based education is often simplified to brain-based.

For clarification, in this thesis I adopt the view that neuromyths are subsumed within all the operational devices of brain-based education. I adopt the inverse view too, that the associated neuromyth i.e. contested neuroscience knowledge can exist independently of its operational devices. In furtherance of this position, I argue that the idea of a neuromyth has not always been brought into the literature as a tightly defined or consistent theoretical construct. Unhelpfully, the convention in the literature appears to be that the word neuromyth is ascribed to mean the contested neuroscience knowledge and/or the operational device that it generates, leaving the reader to infer whether the authors are talking about contested neuroscience knowledge, its operationalisation as a (contested) teaching strategy/methodology or both. Even more problematic is the serial conceptualisation of a neuromyth as both (disputed) knowledge and belief of that knowledge. The conflation of knowledge and beliefs is perhaps understandable in the neuroeducational context given that it is also pervasive across academia (Gess-Newsome, 1999). Nevertheless, where the word neuromyth is used by others to mean <u>only</u> contested neuroscience knowledge I will continue to refer to it as a neuromyth. Where I conclude the word neuromyth is used to mean the contested neuroscience knowledge and/or the operational device, or cannot differentiate between the two, I will use 'neuromyth+' instead. I intend however, to continue to fully differentiate the two different meanings in my own narrative. Given its centrality to this study as the brain-based methodology privileged by TEEP, I next expand the earlier discussions of Accelerated Learning.

Accelerated Learning as TEEP's brain-based methodology

In the English national school system, brain-based education is perhaps manifested most prolifically as the methodology of Accelerated Learning (Lew, 2002; Sharp, Bowker, & Byrne, 2008). According to Jones (2004) Accelerated Learning is apparently not another "another 'trendy' initiative" (p. 43). Rather, it is claimed that Accelerated Learning has a long history of being an international movement (Lew, 2012) that has diffused widely across education, government, and business agencies (Rose, 2003). The foremost professional society is the US-based International Alliance for Learning (IAL), founded in 1976 (LeHecka, 2002). IAL publishes its own journal and offers practitioner certification in Accelerated Learning (Lew, 2002). Although the genesis of Accelerated Learning was Suggestopedia, latterly however, it has been supplemented with putative cognitive and affective neuroscience and other educational 'theories', for example, learning style theory, learning modality theory, Multiple Intelligence theory, visualization/imagery/metaphors, music, movement and the visual arts, cooperative learning models, and motivation theories (Jones, 2004; LeHecka, 2002). Accelerated Learning claims to offer a structure and template to design learning programmes and facilitate in a way that ensures each learner's success (International Alliance for Learning, 2012). Jones (2004) asserts that "The area of Accelerated Learning is continuously developing but also its roots are strongly embedded in a well-established body of knowledge around development, learning and education" (p. 22). Indeed, Accelerated Learning is deemed to one of "the most carefully articulated learning methodologies" available to educators (Krippner, 1983 p. 51).

Accelerated Learning arrived in the UK in the early 1980s (Accelerated Learning Systems Ltd, 2018) but Alastair Smith's later variant appears to have penetrated the school market more effectively (BECTA, 2006; Sharp et al., 2008). This was perhaps in part because it was boosted by high-profile academic endorsements. Professor John MacBeath, Chair of Educational Leadership at the University of Cambridge, decreed that Smith's (1998) book *Accelerated Learning in Practice* "offers teachers something rich and powerful. Not a blueprint, but a set of well researched guided principles" (MacBeath cited in Smith, 1998, n. p.). It was marketed as a new, progressive, and innovative neuroeducational programme to accelerate and optimise student motivation and achievement. Styling himself as the UK's leading Accelerated Learning trainer (Smith, 1998), Smith perceived Accelerated Learning to be:

> an umbrella term for a series of practical approaches to learning which benefit from new knowledge about how the brain functions; motivation and self-belief; accessing different sorts of intelligence and retaining and recalling information. Accelerated learning carries with it the expectation that, when properly motivated and appropriately taught, all learners can reach a level of achievement which currently may seem beyond them (Smith, 1996, p. 9)

The scientific basis of Accelerated Learning has been contested in the wider educational academic literature for some time now (e.g. Coffield, Moseley, Hall, & Ecclestone, 2004; Hyatt, 2007; Sharp et al., 2008). The proposition that Accelerated Learning is a modern and eclectic construct whose claims to improve academic performance are unfounded is hegemonic within neuroeducation (e.g. Boyd, 2004; Howard-Jones, 2007). This opinion pivots on the assertion that Accelerated Learning is in fact a blend of pop neuroscientific knowledge about how the brain functions and learns with psychology and existing pedagogy. Nonetheless, Accelerated Learning was incorporated without apparent due diligence into TEEP as one of its five underpinning elements. TEEP frames Accelerated Learning as, "a structured model for actively engaging learners in learning. It is based on research of brain function, student motivation and multiple intelligences and provides a platform for life-long learning" (SSAT, 2018, para. 11). TEEP was not the only English teaching and learning initiative to incorporate elements of brain-based education into its methodology. 'Learn2Learn' (L2L) was presented by the Campaign for Learning to "help learners learn more effectively and so become learners for life" (Lucas & Greany, 2000, p. 5). With the alluring strapline "At its heart is the belief that learning is learnable" (Lucas & Greany, 2000, p. 5), L2L drew on "new thinking about learning itself, such as that on learning cycles, memory, Neuro-Linguistic Programming, e-learning and accelerated learning [sic], in terms of standards of achievement, motivation, and the development of positive learning attributes" (Rodd, 2002, p. 4). Although L2L was not branded as brain-based, many of the key brain-based agents were credited with informing the campaign. Accordingly, L2L might be positioned as the English mainstream brain-based methodology prototype.

The main operational devices in Westford's variant of Accelerated Learning

As a delimitation, my study will only focus on those brain-based teaching strategies and methodologies that formed part of Westford's approach to the Accelerated Learning component of TEEP PD. Explicit mentions of operational devices in the packs distributed to Westford TEEP attendees included VAK theory, Multiple Intelligence theory, Brain Gym® and Whole Brain Learning. Further individual brain-based teaching strategies featured in the initial PD material used for some group exercises but not distributed include Brain Laterality, The Mozart Effect, Mind Mapping, and Enriched Environments and arguably necessarily underpinning Accelerated Learning is the neuromyth, the 10 per cent Myth. Accordingly, this group forms the cohort of operational devices that feature in this study. For each operational device, there is an extensive discourse available in the literature in its widest sense (i.e. practitioner and scholarly). Particularly, the documentation and disparagement of neuromyths and educators' surmised practice of them has provided neuroeducationalists with a plentiful source of publications (e.g. Clement & Lovat, 2012; Geake, 2008; Lindell & Kidd, 2011; Purdy, 2008; Weigmann, 2013).

Smeyers (2016) maintains that this rhetorically played out obsession with neuromyths+, or "urban legends" (p. 72), is indicative of neuroeducationalists' own neurophile dispositions. I suggest that it also evidences some contradictions in what to all intents and purposes is a tightly-woven but pejorative narrative. For example, Geake (2008) labels VAK theory as practical nonsense finding it difficult to imagine how educators cope with the "ridiculous paradox" of "the A and K 'learners' at an art lesson/ the V and A 'learners' in a craft practical lesson?" (p. 131). His claim is that educators in the face of the practical difficulties posed by the VAK theory model of practice, deliver a "mixed-modality pedagogy" (p. 131). Indeed, Guild (1997) contends that in the classroom, the observable practice of VAK theory and Multiple Intelligence theory would be virtually indistinguishable from routine teaching. Nevertheless, this possibility continues to be overlooked by neuroeducationalists with, for example, Rato, Abreu, and Castro-Caldas (2013) still asserting that the ordinal version of VAK theory has flooded education. For my thesis, the important aspects of this discourse are what the real science was, and how this then formed the basis of the contested science and crucially in terms of practice, details of the ensuing the model of practice. A summary of this discourse is presented in Table 2.2.

This exemplification of the operational devices within the LA's variant of Accelerated Learning is key to this study: I revisit it frequently as I progress through the thesis. It is now followed by a critical account of brain-based education's designation and aims as proposed by its community of practice, as well as how it is typically disseminated by its architects and advocates.

Table 2.2: The main operational devices of brain-based education in Westford's TEEP PD

Common name	Neuromyth	Intended Model of Practice
VAK theory	There are three dominant forms of mental processing: visual (sight, mental imagery), auditory (sound, speech) and kinaesthetic (touch, temperature, pressure and emotion). The processing profile of an individual determines their optimum way of learning.	Originally the advice was to teach to the dominant form of mental processing. For example, kinaesthetic learners should be taught using "DART, role-play, dance, model-making … freeze-frames … human graphs" (DfES, 2004, p. 14). TEEP advocated the use of a multisensory approach to VAK theory. This encouraged teachers to provide learning opportunities in all three modalities. Practising VAK theory like this however is indistinguishable from normal teaching. This multisensory approach is more consistent with current neuroscience.
Multiple Intelligence theory	There are nine separate intelligences rather than a single general intelligence; logic-mathematical, verbal/linguistic, interpersonal, intra-personal, spatial, musical, movement, naturalistic and existential. The intelligence profile of an individual determines their optimum way of learning.	Match teaching to the dominant intelligence. For example, verbal/linguistic students should be taught using "Discussion, group work, pair work, debates, interviewing, expositions, … listening to guest speakers, mnemonics" (DfES, 2004, p. 14).
Whole Brain Teaching	The two hemispheres of the brain function in fundamentally separate ways and are to some degree independent of each other. Each quadrant is associated with a different learning style.	When the whole brain is engaged, learning is optimised. In practice, this means giving equal opportunities for each brain quadrant during a lesson (Herrmann, 1996).

Common name	Neuromyth	Intended Model of Practice
Brain Laterality (Left Brain/Right Brain)	The two hemispheres of the brain function in fundamentally separate ways and are to some degree independent of each other. The hemispherical profile of an individual determines their way of learning best.	Match teaching to the dominant hemisphere. For example, left brainers should be taught in structured, orderly classrooms and allowed to make lists from their notes.
Brain Gym® (methodology)	Certain physical movements of the body stimulate the integration of neural connections in "dimensions" leading to an improvement in overall performance and/or ability.	The use of 26 movements, each designed to target the improvement of an academic skill. For example, to improve reading comprehension, The Calf Pump, the Footflex and/or The Grounder exercises would be used (Dennison & Dennison, 2010).
The Mozart Effect	Babies' IQ can be enhanced by listening to Mozart and other baroque classical music.	Playing (classical) music to students during the learning process enhances learning.
Mind Mapping	The two hemispheres of the brain function in fundamentally separate ways and are to some degree independent of each other.	A graphic technique for note-taking/note-making that will enhance learning and performance. [Note taking is organising thoughts in a creative and personal way whereas note-making is "summarising someone's thoughts as expressed in a book, article or lecture" (Buzan & Buzan, 2003, p. 44).
Enriched Environments	Enriched environments improve synaptic density. Greater synaptic density results in a greater learning capacity.	Teaching in enriched environments will result in more learning. An enriched teaching/learning environment attends to space, heat, light, ventilation and ensures that stress is eliminated through the fostering of positive classroom relationships and interactions (Smith, 2003).
10 per cent myth (**neuromyth only**)	Typically, only 10 per cent of your brain power is used.	The 10 per cent myth is one of the most popular neuroscientific myths (Wanjek, 2002). It is the claim that the right combination of brain-based teaching strategies will unleash students' hidden brain reserves leading to improvements in learning outcomes rather than a directly relatable teaching strategy.

Disciplinary issues

Neuroeducation may be a neophyte field (Smeyers, 2016) and as such engaged in fundamental debates about how it should be signified, what its purpose is, and its disciplinary nature is but:

> What many of mind, brain, and education do seem to agree upon is that the field that integrates neuroscience, education, and psychology will not be referred to as 'brain- based education' because this is the nomenclature of those authors who are accused of haphazardly applying neuroscientific findings to curriculum and instruction. The term 'brain-based education' is used in many so-called popular press books, websites, and programs that are written to assist and guide teachers in directly applying the findings of neuroscience to curriculum and instruction in the classroom (Alekno, 2012, p. 5).

Names used synonymously to mean brain-based education include the popular variants *brain-compatible instruction* (Einfalt, 2002; Erlaur, 2003), *brain-based learning* (Weimer, 2007), *brain-based schooling* (Caine & Caine, 1991), *brain-based instruction* (Hutchins, 2009; McNamee, 2011) and *brain-compatible learning* (Nunnelley, Whaley, Mull, & Hott, 2003; Raffin, 1996). Notions of 'brain-friendly' (Biller, 2003; Perez, 2008), 'brain-compatible' (Buster, 2008) or 'brain-targeted' (Hardiman, 2003; Ronis, 2007; Tate, 2003, 2004, 2005) are also often mobilised. Although brain-based education may share nomenclature contestation with neuroeducation, the dispute does not spill over into matters concerning conceptualisation, as Jensen's simple definition suggests:

> Brain-based education is best understood in three words: engagement, strategies, and principles. Brain-based education is the 'engagement of strategies based on principles derived from an understanding of the brain' (Jensen, 2008b, p. 410).

Brain-based education is a multi-million-dollar industry (Greenwood, 2006). Cunningham furnishes us with an idea of how some allegedly have used brain-based education to lucrative personal effect:

> Trainers like Eric Jensen, David Sousa, Geoffrey and Renatta Caine, and Pat Wolfe … command speaking honorariums between $2500 and $3500 per day and must be booked over a year in advance because they have so much business. Eric Jensen held a '3-day Brain/Mind Learning Conference'… and more than 900 people paid over $100 per day to listen to scientists or translators discuss recent brain research (2000, p.20).

"The booming business in brain-booster products" (Willis, 2008, p. 424) extends beyond conference appearances and the selling of PD. There is also an extensive 'practitioner' publications output devoted to brain-based education (Hook & Farah, 2012). Each of the individuals quoted above has a prolific publications output and an online presence. For example, the ASCD (formerly the Association for Supervision and Curriculum Development), a global membership-based non-profit organisation writes of its author Eric Jensen:

> In 1981, Jensen cofounded the United States' first and largest brain-compatible learning program, now with more than 50,000 graduates. He has since written Teaching with the Brain in Mind, Brain-Based Learning, Enriching the Brain, and 25 other books on learning and the brain" ("Association for Supervision and Curriculum Development Authors," 2017, para. 2).

It is unsurprising that there is a reasonable consensus in both fields that Jensen, Wolfe, Sousa, and Caine and Caine constitute the leading American brain-based education 'names' (Bruer, 1999; Howard-Jones, Franey, Mashmoushi, & Liao, 2009; Walsh, 2010). I have already suggested that the English equivalent is Alistair Smith.

Within brain-based education these individuals are perceived to be 'translators' of brain research (Buster, 2008; Cunningham, 2000; Lew, 2002), 'experts' in brain research (Brodnax, 2004), 'neuroeducators' (Jorgenson, 2003; Shepherd, 2012) and 'theorists' (Lew, 2002; Wachob, 2012). Often, they are also believed to be primary neuroscience researchers (Bachman, 2012; Denton, 2010; Weimer, 2007). Problematically though, rather than sourcing explanations of brain function and brain science from neuroscience directly, such second-hand accounts of neuroscience are frequently adopted uncritically by many. For example, Shepherd writes that "Wolfe (2001) explained that music stimulates the same brain neurotransmitters, chemicals, and hormones that trigger emotions. Musical songs and rhyme set to music enhance retention of the information and give an advantage to the recall level of learning (Wolfe, 2001) [sic]" (2012, p. 26).

When the discussion in Chapter 1 is considered, the picture that emerges is that when it comes to opinions of brain-based education, there are two diametrically and vehemently opposed factions. I next explore how brain-based education generates such oppositional emotions and opinions. To do this I invoke the concept of a condensation symbol. A condensation symbol is defined as:

> A name, word, phrase, or maxim which stirs vivid impressions involving the listener's most basic values … The precise meaning … and whether or not they constitute a condensation symbol depends on the individual who uses or hears them … Condensation symbols supply instant categorisations and evaluations (Graber, 1976, p. 289-292).

Love it or hate it!

Marmite is a UK food product that has a very distinctive flavour. Because it connotes deep emotions, or "clashing panoplies" (Graber, 1976, p. 292) about whether it is likable or not, it is the embodiment of a condensation symbol. Indeed, it is purposefully marketed with the slogan *Love it or hate it* and accordingly it has infiltrated British culture and language to the point where the word Marmite is used to describe anything that similarly evokes strong emotive reactions and significant divisiveness (Gabbatt, 2016). I propose that, like Marmite, brain-based education can be described as a condensation symbol because there are a multiplicity of voices simultaneously and vociferously beholding and decrying it. In this section I outline the main arguments on both sides of the 'Love it or hate it!' divide. I begin with those who 'Love it!', namely the brain-based community who protest that brain-based education is legitimate and useful, and deserving of acclaim rather than derision.

Love it!

The premise underpinning brain-based education is that neuroscience does produce knowledge that can and should be used to both inform and create educational theory and practice. Jensen has consistently maintained that neuroscience generates a considerable degree of useable knowledge. He is not alone: indeed, many of his contemporaries take the same view (Colburn, 2009). Jensen insists that education can and should accept neuroscience knowledge based on likely and unlikely, rather than certain and uncertain. He concludes that education can't afford to wait 20 years until the science is proved fully because "an accumulating body of empirical and experiential evidence confirms the new model" (Jensen, 2008, p. 409). His position that the time is 'right now' also finds favour amongst some educationalists. For example, the OECD report on their Learning Sciences and Brain Research project already referenced included the following similar affirmation in the Practitioner's response section:

> In my view it is not premature to apply the cognitive neuroscience findings to teaching. The neuroscience findings so far are very encouraging and seem to be in direct agreement with educational thinking. The gathering of more information about the relationship between neural functioning and

> instructional practice to assist educators, seems to lead to the aboriginal issue of who came first the chicken or the egg? (Bharti as cited in OECD, 2007, p. 180).

A committed proportion of brain-based proponents consider brain-based education to be a theory of learning that derives its legitimacy from the constructivist position (e.g. Gülpinar, 2005; Wachob, 2012; Zull, 2006). Constructivist learning theories advance teaching approaches that are active, task-orientated, hands-on and self-directed that enable learners to construct their own mental structures (e.g. Papert, 1962; Piaget, 1954). Translating constructivism into the classroom requires educators to the relinquish the role of a transmitter of knowledge for that of a coach, catalyst, and/or guide. Perhaps this is why Rushton and Larkin (2001) state that "Brain research helps to explain further why constructivist educators such as Dewey (1964), Piaget and Inhelder (1969) and Vygotsky (1967) still prevail" (p. 32). Ferrari (2011) goes further to claim that applicability is demonstrated in the work of Piaget and Vygotsky, whom he argues, incorporated neuroscience research into their theories. Many educators believe that brain-based education provides a stronger rationale for explaining why some existing teaching practices are effective (e.g. Crossland, 2010; Lombardi, 2008; Rushton & Larkin, 2001). The implementation of brain-based education leads to positive experiences for students and teachers (e.g. Griffee, 2007; Pennington, 2010; Roediger, 1980). It is similarly claimed that students prefer to take part in classes where these strategies are used (e.g. Burkett, 2014) and that student's motivation levels have increased (e.g. Saleh, 2011). Moreover, and perhaps central to later arguments in this thesis, it is asserted by many that brain-based education causes improvements in learning outcomes (e.g. Bello, 2007; Lathan, 1997; Nussbaum, 2010). There are perhaps as many studies that claim to show this last point empirically as there are that claim to show the opposite. This is beyond the research remit of this inquiry, so I do not provide information on, or discuss any of these.

McCall (2012) advocates brain-based learning as "an exciting idea that offers hope to those of us who search to find meaning and excellence in all spheres of education - for all learners" (p. 42), cautions that it shouldn't be adopted on impulse or without undertaking due diligence. Weimer asserts that "BBL has been the method that all good teachers have used for years to get and keep students engaged (Weimer, 2007, p. 134). Jensen contends that the brain-based movement has performed a valuable service for the educators by bettering their' teaching skills and improving their understanding of the brain, brain function and cognition. Furthermore, the presumed benefits of brain-based education extend to increased professionalism and criticality and even perhaps EBP as Jensen clarifies:

> As a result of years of work by brain-based educators, educators are a far more informed profession. They are more professional, they look more at research, and they are increasingly more capable of understanding and incorporating new cognitive neuroscience discoveries than they were (Jensen, 2008, p. 415).

Guild (1997) observes that educators who believe in the concepts of brain-based education bring an attitude and approach to teaching that prioritises the diversity and uniqueness of learners. Brain-based education is not a panacea or a "cookbook approach to teaching" and nor is it to be applied simplistically, it is a catalyst for positive student learning in an educational system where for many varied reasons too many students are unsuccessful in their learning endeavours (Guild, 1997, p. 31).

In short then, in the minds of the brain-based community, brain-based education is perceived as a force for good. It is not considered to be problematic or more extremely, a model of practice that requires purging from educators' toolkit of models of practice. As I have intimated though, there is another quite different opinion abroad, and this is what I turn to next.

Hate it!:

Neuroeducation's antipathy to brain-based education has been outlined previously but I explore this position more fully now, by summarising and then critiquing those hostile themes in the literature that are material to this thesis. There are two overarching themes present in neuroeducators' commentary of brain-based education. Firstly, there is a section of discourse that relates to an exogenous and endogenous set of putative reasons behind brain-based education's emergence as the phenomenon that it is, and next, there is a series of related critiques about the perceived problematic nature of brain-based education. I begin with the latter, leaving the review of firstly the exogenous factors that have been used to explain the emergence of brain-based education and secondly, the examination of the putative endogenous factors until later.

Critiques of brain-based education:

As Alekno's (2012) earlier quote powerfully evidences, brain-based education, its architects and purveyors are disliked by neuroeducationalists for many reasons. An indicative list of the more prevalent ones follows. Brain-based education is perceived to dupe educators, exploit their enthusiasm, waste their valuable time (Howard-Jones, 2007; Kratzig & Arbuthnott, 2006), and pour "precious educational resources into scientifically spurious applications" (Goswami, 2006, p. 6). Thus problematically, other more appropriate teaching and learning activities are disadvantaged (Anderson & Della Sala, 2012; Bruer, 1999; Hardiman, Rinne, Gregory, & Yarmolinska, 2011). There are also moral and ethical objections posited (Puckett, Marshall, & Davis, 1999), especially the inappropriate profiling and labelling of students, for example by VAK theory and Multiple Intelligence theory. It is also argued that brain-based education wrongly gives children incorrect ideas about their brains and bodies (Howard-Jones, Pickering, & Diack, 2007; Sense About Science, 2008). Another objection asserts that children should not be exposed to unproven teaching methods (Davies, 2000). Furthermore, its use is considered to cheapen the professional reputation of educators (Sharp et al., 2008) and impair the quality of teaching (Rato et al., 2013). Apparently, brain-based education does not add anything in the way of new educational theory (Alferink & Farmer-Dougan, 2010) and Rato et al. (2013) consider that brain-based education has infected the educational culture of schools.

More 'theoretically', Bruer (1999) feels that brain-based education purposively positions itself as a way to attack a Fordist approach to the delivery of schooling and that it is disingenuous to harness (purported) neuroscience in that venture. He asserts that "Brain-based educators tend to support progressive education reform. They decry the 'factory model of education', in which experts create knowledge, teachers disseminate it and students are graded on how much it they can absorb and retain (p. 649). Fordism was a "system of mass production and consumption characteristic of highly developed economies during the 1940s-1960s" (Thompson, n.d., para. 1). The Ford Model T's phenomenal success in the marketplace owed itself to the efficiencies and thus economies arising from the mass production of one only variant of the car. Henry Ford's declarative statement that "Any customer can have a car painted any color [sic] that he [sic] wants so long as it is black" (Ford & Crowther, 1922, p. 72) summed up his approach to the customisation and variation of the Model T car, namely, none. In the Fordist model of education, standardisation is privileged over customer choice and voice, and the overarching aim is to maximise output. Perhaps what is material here is that although

Bruer is at pains to reject the Fordist model of education too, I am left with the impression that he did not seem to know that there was a strong narrative present in the wider educational literature which saw Fordism superseded by post-Fordist successors (for example, Carter, 1997; Jessop, 1993; Watkins, 1994) or even approaches considered to be neo-Fordist (Avis, Bloomer, Esland, Gleeson, & Hodkinson, 1996; Hodkinson, 1997). At this point in the thesis it is relatively unimportant whether indeed any of these Fordist theoretical architectures can or should be deployed as explainers of the present-day education system, however this situation presents one corollary that is material to my later arguments. I argue that even in 1999, Bruer was offering not only an unsympathetic critique, but a critique that was inappropriate because it failed to take account of the then ideological turn (see Chapter 3), albeit nascent, in not only the education system per se, but in the academic discourse that enveloped it. In other words, his view of operant education policy theory and practice was arguably partial, outside and selective because it was not fully reflective of the reality of the time. This critique of the failure of the neuroeducational literature to recognise and account for the dominant ideological/political context of education which has implications for the situation educators find themselves in is important. Unfortunately, he is not alone. As I shall show in the review of the neuroeducational discourse that follows directly, there are other instances where an absence of a contemporary and complete view occurs. Consequently, at the end of this section, drawing all such instances together, I return to this idea to explain how it contributes to the need for an examination of the theoretical literature as it relates to the practitioners' operational environment (i.e. I use it as a rationale for Chapter 4).

Returning to the more pragmatically orientated criticisms circulating about it, brain-based education is considered to be a major obstacle to the proper integration of education and neuroscience, primarily because of its deemed culpability in the spread of neuromyths (Rato et al., 2013). Finally, and somewhat linked, it is suggested that brain-based education is responsible for inhibiting the development of EBP in education (Pasquinelli, 2011; Sylvan & Christodoulou, 2010). This final critique relates to the neuroeducational position that education's deficiencies *vis-a-vis* scientific research have acted as an enabler for brain-based education's rise. Consequently, I next move to consider the rationales provided by neuroeducationalists for the phenomenon of brain-based education within the educational sector.

Brain-based education's putative exogenous causative factors: The a priori assertions of neuroeducation concerning the exogenous factors that give rise to brain-education can be grouped into three types. The first involves reasons around the perceived nature of education itself. The second concerns the allure of neuroscience and the last concerns the educators themselves. I consider each of these in turn starting with how neuroeducationalists attribute brain-based education's emergence and popularity to the supposed nature of the field of education.

Education: It is asserted that education has always had a difficult relationship with empirical science (Condliffe Lagermann, 2000; Shavelson & Towne, 2002). Statements like "If Avon and Toyota can spend millions on research to create better products, how can schools continue to use alleged 'best practices' without collecting evidence about what really works?" (Fischer, Goswami, & Geake, 2010, p. 69) harbour the typical scholarly frustration felt about some of education's apparently less helpful proclivities in this regard. Moreover, education is thought to be unable to effectively scrutinise scientific research (Howard-Jones et al., 2007). This comment from the OECD typifies the feeling within neuroeducation that education's response to brain-based education is symptomatic of its wider susceptibility to accept purportedly unscientific initiatives:

> In an uncertain educational world, new ideas are readily welcomed, especially if they appear as a panacea but even if just an embryonic solution. Were education to be more confident of itself, half-truths, ready-made solutions, quarter-panaceas, and myths would have less chance to proliferate (OECD, 2007, p. 124).

These purported inadequacies leave some neuroeducationalists asserting that education needs reform (e.g. Stein, della Chiesa, Hinton, & Fischer, 2010). Indeed, according to Pasquinelli (2011) educational systems should be based on science, not tradition, intuition, or professional wisdom. The proposed remedy to alleviate these presumed deficiencies is that of a science of learning where neuroeducation would lead from the front (e.g. Fischer et al., 2010; Kelly, 2011; Pasquinelli, 2013). Thus seemingly, for many neuroeducationalists it is education's relationship with empirical research that is a contributory factor to the phenomenon of brain-based education. The second reason volunteered by neuroeducationalists for the phenomenon of brain-based implicates the 'allure of neuro'.

The allure of neuro: The allure of neuro or more newly, "neuromania" (Legrenzi & Umilta, 2011, p. 27) or even "neuro-everything" (Hook and Farah, 2012, p. 336) may be a recent theory but nonetheless it is a dominant one. The research of Weisberg, Keil, Goodstein, Rawson, and Gray (2008) is universally cited in support of such pronouncements (e.g. Anderson, 2012; Ferrari, 2011; Howard-Jones, 2008, 2009). Her study presented adults, neophyte neuroscience students and neuroscience experts with a choice of good and bad explanations of psychological phenomena, some of which held irrelevant neuroscience and some of which didn't. She found that explanations of psychological phenomena seemed to generate more public interest when they held neuroscientific information. More relevantly to the research focus here perhaps, the inclusion of the spurious neuroscientific information had a particularly striking effect on non-experts' judgements of bad explanations masking otherwise salient problems in these explanations. Ultimately, the inclusion of irrelevant and unnecessary neuroscience caused the non-experts to be unable to critically assess the underlying logic of the explanations. Howard-Jones (2011) marshals the research of Weisberg et al. (2008) research to conclude that the conflation of mind and brain typical of brain-based education enables some "educational practices to gain an apparently neuroscientific flavour. This can, deceptively, add to their attractiveness because explanations provide greater satisfaction when they include neuroscience" (p. 111). Much less cited is the research of McCabe and Castel (2008) who found that the mere presence of brain images in articles increased readers' acceptance of the scientific arguments presented. More widely, blame has been attributed to the hegemonistic position of science within society and the ensuing the deference to it. Stein et al. (2010) observed that "There are many plausible explanations for the effects of neuroscience claims on marketing, including that the Western world is dominated by a positivistic/scientistic [sic] mindset that preferentially accepts material explanations" (p. 7). Some more generally blame society's unrealistic expectations of science for the pursuit of overly simplistic explanations (e.g. Bruer, 1997; Fischer et al., 2007).

Varma et al. (2008) maintain that the thriving set of commercial activities noted earlier that have sprung up around brain-based education are propelled by "neuromarketing" strategies (p. 144) that capitalise on this neuro "dazzle effect" (Keehner & Fischer, 2011, n. p.) Neuromarketing strategies are those tactics pursued by marketers where scientific brain images and neuroscientific language are purposefully included to manipulate consumer opinion in marketers' favour and ultimately enhance sales of the product. Lindell and Kidd (2013) showed empirically that neuromarketing strategies boosted the popularity of a fictitious brain-based education product called *Right Brain* amongst UK adults. They concluded that by "implying a strong scientific basis, 'brain-based' product names are remarkably effective in implicitly manipulating consumer opinion" (p. 35). Apparently, even academics are not immune to harnessing the power of neuromarketing. Hook and Farah contend that to purposefully connote favourable connections with neuroscience in order to presumably invoke its prestige and scientific rigour (Vidal, 2008) high-profile scientists use brain in titles of their theories:

> for example, John Medina's use of the term 'brain rules' and Carol Dweck's use of 'brainology' to label her research on attitudes toward achievement. It seems likely that such terminology was chosen in part to attract attention in the age of 'neuro-everything' (Hook and Farah, 2012, p. 336).

In the interests of balance, it must also be pointed out that influential neuroeducational authors have not been averse to use of the same tactic (e.g. Goswami, 2006; Howard-Jones, 2009, 2014).

Educators: Lastly, and most importantly when it comes to an examination of the reasons adduced for the phenomenon of brain-based education are those that concern educators themselves. The neuroeducational field writes about educators and their purported affinity for brain-based education in a negative way. Educators are considered to be faddists (e.g. OECD, 2007; Geake, 2008). They are perceived to be looking for quick fixes, easy to follow recipes and 'silver bullets' (e.g. Ansari and Coch, 2011; Hardiman, 2010). Using VAK theory for the provision of differentiation is one such silver bullet according to Howard-Jones (2008). Goswami (2006) believes that educators are looking for broad-brush messages and like being told what works. Bruer (1999) hypothesises that educators have always found neuroscience appealing as they prefer "hard" biological explanations to "soft" psychological ones (p. 650). More blunt opinions also exist: educators are held to be research averse (Ansari, 2008) or even research avoiders (Samuels, 2009).

Purdy (2008) is not atypical when he recommends that educators would benefit from being more systematic in their adoption of research. Schunk (1998) accuses educators of making the mistake of over-generalising research because they do not fully understand the wider developmental context. Rather dramatically perhaps, the entire future of neuroeducation is seen by Geake (2011) to be at the mercy of educators' engagement with brain research. Goswami (2006) asserts that not only do educators have immense goodwill towards neuroscience but that "there is a hunger in schools for information about the brain. Teachers are keen to reap the benefits of the "'century of neuroscience' for their students" (p. 2). Likewise, Geake (2004) writes that educators are conservative but enthusiastic for information about the brain and its functioning. Educators will however need help from scientists in this and the other endeavours as firstly the nature of the material is 'apparently' 'technical' and 'confusing' and therefore difficult to navigate (Ablin, 2008; Alferink & Farmer-Dougan, 2010; Sylvan & Christodoulou, 2010) and secondly, they are "especially vulnerable to these [brain-based] misunderstandings" (Rato et al., 2013, p. 442). This is however an example of what Anderson and Della Sala (2012) see as the proclivity of neuroscientists to patronise educators. In recognising the condescending tone of much of the discourse as it concerns educators' putative desires, preferences, and capabilities, Anderson and Della Sala appear to be swimming against the prevailing tide of opinion in the neuroeducational community. The disapproving tenet prevalent in the discourse also extends to educators' weaknesses and deficiencies and I turn my attention to this next.

It is asserted that if educators had a contemporary and accurate understanding of even basic neuroscience, or better still, cognitive neuroscience they would exercise more criticality and thus be more resilient to believing in neuromyths (Ansari & Coch, 2006; Hinton & Fischer, 2008; Sylvan & Christodoulou, 2010). Educators, it is argued, should also have a better-informed opinion of neuroeducation (Dekker, Lee, Howard-Jones, & Jolles, 2012). But to do this they would need specific instruction in neuroscience to improve their neuroscientific literacy (Geake, 2004; Willis, 2008; Zull, 2006). There are many calls for this to become a routine part of educators' PD (e.g. Fischer et al., 2010; Royal Society, 2011). In fairness however, although this ideal is echoed by the brain-based movement (Baylor, 2000; Jensen, 2008a; Wolfe, 2001), it is the understanding of what counts as neuroscience that sees the two sides diverging. Some suggest that this knowledge of the brain should be taught pre-service (Ansari & Coch, 2006; Geake, 2004; Geake & Cooper, 2003) as well as in-service.

To copy the model of teaching hospitals is one heavily proposed solution to educators' disconnection from scientific research (Fischer, 2009). The creation of high quality research schools meets with considerable approval (Coch, Michlovitz, Ansari, & Baird, 2009; Ronstadt & Yellin, 2010; Schwartz & Gerlach, 2011) and like the brain-based educationalists, they are keen not to forego making the analogy with Dewey's 'laboratory schools'. This would create/require a new class of educators - the idea of 'neuroeducators' (e.g. Ansari & Coch, 2006; Gardner, 2008; Ronstadt & Yellin, 2010; Stein et al., 2010) is apparently not new (Cruickshank, 1981; Fuller & Glendening, 1985). Conceptualised by neuroeducationalists as educational 'engineers' or 'translators' their main task would be to apply findings from cognitive science and neuroscience to learning in classrooms (Fischer et al., 2010).

To sum up, I have discussed the three pervasive themes in the neuroeducational literature that purport to explain the exogenous factors that give rise to the phenomenon of brain-education. I next address that neuroeducational literature which deploys factors endogenous to brain-based education to rationalise its emergence and popularity amongst educators.

Brain-based education's putative endogenous causative factors: There is a pervasive assumption abroad that the developers of brain-based education have either inappropriately or deliberately "fill[ed]-in-the-gaps" (Alferink and Farmer-Dougan, 2010, p. 48) to create an appealing but consummately pseudo/quasi-scientific product. In other words, the purported endogenous causes of brain-based education bifurcate. Essentially these are firstly the belief that, to employ a popular idiom, a little knowledge is a dangerous thing, and secondly, that 'pedagogical privateering' has been at play. I deal with the former reason first as this seems to be the reason that attracts the most antipathy for the neuroeducationalists, as indeed as I noted earlier, a substantial amount of their published outputs seems devoted to highlighting and then correcting the putative neuroscience mistakes made by brain-based educationalists.

A little knowledge is a dangerous thing: One assumed causative agent is the current proliferation of educational consultants and professional developers all of whom it is claimed, have no credentials in neuroscience, science or even medicine (Jorgenson, 2003). Since they are not scientists, they have formulated bold ideas about education and neuroscience that are often far removed from what is accepted as knowledge within the scientific community (Bruer, 1999). Consequently, scientists are emboldened to assert that "The only way that brains are involved in most brain-based education is that the students have brains" (Fischer & Immordino-Yang, 2008, p. xviii). It is held that brain-based education has been conceived in the flawed belief that science can be directly taken from the "petri dish to pedagogy" (Coch & Ansari, 2012, p. 34) or from "brain scan to lesson plan" (Howard-Jones, 2011, p. 34). Problematically in the case of the later, the use of neuroscience originating from technologies that only image brain regions, for example fMRI, PET, or EEG, to suggest educational practice is erroneous because such brain scans only generate correlational relationships of the brain-function in question rather than causal ones (Cerruti, 2010). Aron (2008) likened fMRI to phrenology in that it only tells stories rather than giving explanations (cited in Miller, 2008). Moreover, as yet, the accuracy or meaning of some of these measures of brain-function is relatively unestablished (Logothetis, 2008; Poldrack, 2006). Perhaps the last word on this belongs to Petersen, a US based brain-imaging researcher "The problem right now with imaging is that doing experiments right is really, really hard, but getting pictures out is really easy" (cited in Miller, 2008, p. 1412). With this mind, the attempts at "bench to bedside" (Brosnan & Michael, 2014, p. 681) 'translation' of neuroscience research by the designers and purveyors of brain-based education have resulted in compelling stories characterised by a desire to deliver on the promise of porosity than to be scientifically valid. This leads Alferink and Farmer-Dougan (2010) to conclude that "The problem, then, is not with the neuroscience data themselves, but how authors of these purported brain-based approaches appear to have erroneously filled in the missing research gaps" (p. 48).

We are told that the problems with brain-based education's ensuing pseudo-scientific narrative are manifold. For example, Davies (2004) critiques the creators and propagators of brain-based education singling out Jensen (1998), Wolfe and Brandt (1998) and Wolfe (1998) who in his opinion have been especially culpable of creating nonsense explanations about brain function involving fundamental category mistakes about the mind/body division. More widely, brain-based educators apparently conflate neuroanatomical observations with subjective and normative pronouncements (Davies, 2004). Moreover, not only are brain-based educators accused of misrepresenting psychology as neuroscience (Hall, 2005), worse still, they use 'old' psychology that:

> Can be found in any current text book on educational psychology. None of the evidence comes from brain research. It comes from cognitive and developmental psychology; from the behavioural, not the biological, sciences; from our scientific understanding of the mind, not from our scientific understanding of the brain (Bruer, 1999, p. 649).

This inspired Bruer (1999) to connect this cause with a cause previously discussed. He concluded that the seductive appeal of neuroscience when coupled with limited knowledge thereof was indeed, a dangerous combination. This provided me with the inspiration for the categorisation of this section of the thesis. Up to this point in this section, the neuroeducational antipathetic narrative is perhaps most aligned with that of the Santiago scientists' more nuanced and scientifically underpinned misgivings about the perceived misuse of science by non-scientists. As I shall demonstrate in the next sub-section, the narrative becomes somewhat more vociferous and thus more akin to Goldacre's irritated stance on the abuse of science.

Pedagogical privateering: It is perhaps here that neuroeducationalists find themselves sharing Goldacre's outrage at the "misuses of science and statistics by … quacks" (Goldacre, n.d., para.1). Somewhat starkly expressed by Hook and Farah (2012) who consider educators to have been the prey of the brain-based educationalists, or by Jorgenson (2003) who expresses the phenomenon as a scam, or indeed Hyatt (2007) who combatively asserts that frauds have been perpetrated, is the feeling that the teaching workforce has been the subject of a sustained campaign orchestrated by the brain-based industry (e.g. Coch & Ansari, 2012). Whilst the OECD (2007) acknowledged the possibility that "The emergence of a neuromyth may be intended or unintended" they were also quite clear that "interests may well be served by them. Neuromyths often drive business and probably most are anything but accidental" (p. 124). Rato et al. (2013) are perturbed by how "scientific information is shared outside academic circles … [and] is manipulated directly to fit the classroom milieu" (p. 443) with the result that "an entire industry has been established around these products [which] are heavily marketed to educational settings" (p. 442). Dekker et al. (2012) agree deciding that there has been a "fast commercialization [into] … into classrooms around the world" (p. 2).

The OECD (2007) classified educators as "targets" who as a result of being amongst the "frontline "consumers" of education [were] hence disposed to being "sold" ideas (p. 124). Selling such products are irrationally exuberant and inexact boosters of neuroscience (Willingham, 2008), or unscientific entrepreneurs (Howard-Jones, Pickering & Diack, 2007), who employ selling techniques that have been pejoratively described as enthusiastic (Corbalis, 2012), visionary (Jorgenson, 2003) and inspirational (Goswami, 2006). Fazio (1989) noted that the use of nominal disclaimers acknowledging the tenuous nature of neuroscience research have gone unheeded by brain-based educationalists because the brain-based learning industry is not working in the public interest but for profit (Goswami, 2006). With this last rather damming assertion, I conclude my review of the many reasons neuroeducationalists put brain-based education in the *Hate it* rather than *Love it* category.

Conclusion

In sum then, the discourse demonstrates that, for neuroeducationalists there is substantial unification on the pejorative meaning assigned to brain-based education. Brain-based education is framed as a pathogenic and pervasive entity in contemporary education. As such it is something to be eradicated as Pattern concludes:

> the transmogrification of brain research into brain-based teaching must meet its metaphorical demise. Neuromyths must be replaced with ... applied neuroscience ... neuropedagogy (Pattern, 2011, p. 87).

The prevailing doxa (i.e. common opinion) within the neuroeducational community is that large numbers of educators have operationalised the devices of brain-based education uncritically, in the mistaken belief that they are based on scientific knowledge. This doxa generates the division that substantively structures Chapter 4's analysis of the brain-based empirical literature. This doxa centres on firstly the notion that educators have implemented brain-based operational devices at scale. Secondly, the presumption is that educators do not possess the required knowledge to exercise criticality. I explore these two themes in terms of the empirical literature in Chapter 4.

To draw this summary to a close, I return to the point made earlier about Bruer's prima facie understanding of the education system as a factory model of education. It is my judgement that Bruer's inadequate theorising represents a wider malaise in the scholarly literature. That is to say there appears to be a lack of knowledge of the pressures contemporary educators at large in the neuroeducational literature and equally an absence of an appreciation of the wider political and ideological origins of such difficulties. There are several other noteworthy instances in the neuroeducational discourse that I have just reviewed where plausible and alternative rationalisations have been neglected. For example, the assessment of Fischer et al. (2010) that schools should employ research and development techniques to ascertain what 'really works' is, to my mind, another example of neuroeducationalists' scientific mindset, their attempts to impose that on others coupled with a lack of understanding about the way in which the financing of public education has been subjected to managerialist overtones and the consequential time and fiduciary pressures that managerialism has caused at school-level. I expand the notion of 'what works' in the context of the practitioners' operational environment in Chapter 3. Moreover, although there is a unified view that brain-based education has been deliberately created as a profit-making venture, in the discourse that relates to this topic there is a palpable lack of attempt to draw the obvious line between this activity and the contemporary marketisation of education. Consequently, it is my contention that the positionality of the neuroeducational literature is characterised by its proclivity to adopt a tightly-defined causal narrative that gives primacy to scientific explanations and overlooks or denies any causal aspects that may arise as a consequence of education policy and its effects to shape and direct the working environment of educators and thus their teaching behaviours. In other words, neuroeducationalists, I suggest, seem to operate with a curtailed view of the educational panorama.

They opt for 'scientific storytelling' or scientism rather than giving explanations that are available in the readily available political and ideological discourses of neo-liberalism, and the associated technology discourses of performativity, managerialism and marketisation (these terms are clarified in Chapter 3). Scientism is an idealisation of science, and with it comes a predisposition to impress the so-called scientific terminologies and methodologies on all aspects of our lives, education included (Gasparatou, 2017). Besides that, it is "a totalizing attitude that regards science as the ultimate standard and arbiter of all interesting questions; or alternatively that seeks to expand the very definition and scope of science to encompass all aspects of human knowledge and understanding" (Pigliucci, 2013, p. 144). It is somewhat paradoxical that the neuroeducationalists criticise the Western world for being "dominated by a positivistic/scientistic [sic] mindset" (Stein et. al, 2010, p. 7). It is my conjecture that just as brain-based education cannot be examined within a conceptual framework that is exclusively anchored to scientism, neither can any interpretation of educators' responses be artificially divorced from the extant policy context. Indeed, if there is one axiom in social science that stands above all others, it must surely be that context is *sine qua non*.

To remedy this deficiency, I consider that any real, rich and insightful understanding of educators' responses to and enactment of brain-based education can only occur when the context of their teaching conditions is both fully understood and considered. Thus, to comprehensively contextualise the local situation within Westford LA and to contribute to the conceptual framework for the later interpretation of the data, in the next chapter I outline how and why the climate within schools and LAs in England has been driven by a series of policy initiatives and education agencies.

Chapter 3 : Conceptual Framework: Theoretical Literature: Practitioners' Operational Environment

To lay the foundations for the conceptual framework, in the previous chapter I explored the theoretical literature as it pertained to brain-based education and educators' adoption of it as a model of practice. I also introduced a case for the inclusion of a second strand to the inquiry's conceptual framework. Accordingly, in this second conceptual framework chapter I explore the theoretical literature that describes and explains the operational environment of Westford LA.

Chapter overview

To set the scene for this theoretical account of the operational environment of Westford LA I start with a critical synopsis of the contemporary history of the English education system. I then separately document the three key policy mechanisms of performativity, managerialism and marketisation. From this analysis, I move into a discussion about the agencies, initiatives and teaching ideas that shaped models of practice and drove teaching behaviours in Westford LA.

Background and rationale

It has been suggested that state education in England is *sui generis* as an "extreme example of high autonomy-high accountability quasi-market reform" (Greany & Earley, 2017, p. 6). The origins of such a system can be traced back to a convergence of hitherto oppositional political philosophies that transpired in the final decades of the last millennium (Jones, 2016) and whereby English party politics took a "rightward turn" (Apple, 2005, p. 272). During this period, a "rightist alliance" of neo-liberals, neo-conservatives, authoritarian populists and managerialists pursuing a "conservative modernization" (Apple, 2005, p. 272) agenda came to dominate the discourse in social policies in Western societies. Within this somewhat heteroglossic alliance it was the neo-liberal ideologists who held sway (Apple, 2005). Saad-Filho and Johnston (2005) contend that neo-liberalism is apparently easier to recognise than to define in purely theoretical terms but its "most basic feature … is the systematic use of state power to impose … market imperatives" (p. 3) on its domestic system. In the domain of public education, the neo-liberals succeeded in firmly fixing the educational endeavour to national competitiveness (e.g. Bottery, 2000; Papadopoulos, 1994; Tan, 2014) believing "human well-being can best be advanced by the maximization of entrepreneurial freedoms within an institutional framework characterized by private property rights, individual liberty, unencumbered markets, and free trade" (Harvey, 2007, p. 22). The ensuing reform agenda thus predicated on the "neo-liberal grail of 'choice' and 'voice'" (McGregor, 2018, p. 85) has since become a global phenomenon (Sahlberg, 2012, 2015).

Not just confined to Anglo-Western democracies, its uptake been noted in South East Asia (e.g. South Korea, see Hill, Park, and Saito (2011) and elsewhere, e.g. Chile, see Aravena and Quiroga (2016)). Levin (1998) described its spread across continents resembling that of an epidemic, which rather complements Sahlberg's (2012) acronym for it - Global Educational Reform Movement (GERM). Indeed, across the globe, in the absence of any strong counter-narrative and propelled by advances in technology (McGregor, 2018) the prospect of a future founded on ostensibly neo-liberal ideals has transmogrified from the realms of being an aspiration to that of an orthodoxy characterised by the mantra of 'TINA' (There Is No Alternative) (Berlinski, 2011; Peck & Tickell, 2007). Rejection of this "received transmissible paradigm" (Lyotard, 1979/1984, p. 12) is rare, meaning that the practice of performative policies in education systems the world over has become the routine rather than the exception (O'Leary, 2013). Before I explain the theoretical underpinning of the educational reform agenda that has so immutably captured English policymakers' and policy influencers' thinking, using Ball's (2003, p.215) "policy technology" framework, I briefly re-confirm that my aim in this section is to illustrate how, to all intents and purposes, educators in the English education system found themselves burdened personally and held locally responsible by the unrelenting quest for educational improvement imposed by the neoliberal policy drive (Moore & Clarke, 2016).

To prosecute this neo-liberal reform project, from the late 1970s and considerably more so since 1997, central government has subjected state education in England to sustained and substantial range of education policy initiatives aimed at improving school standards. The DfE purposefully engineered a network of educational agencies to variously deliver, enforce and measure the success of this raft of mandated and otherwise policy and practice initiatives. The exact nature and involvement of this collection of educational agencies and teaching initiatives is germane as it underpins that part of the conceptual framework concerning the operational conditions of Westford LA, so I return to this discussion later. Suffice to say for the moment that at the core of this fabricated educational network were, for example, the National Strategies (NS) and Ofsted.

At school-level, working directly with educators, NS quickly introduced a sprawling series of models of practice directed at improving standards by improving the quality of teaching. For example, NS can be credited with pioneering the idea of episodic lessons, behaviour for learning and personalised learning (PL). Likewise, Ofsted, an inspector and regulator of schools and their standards, measured and reported upon the rate (or not) at which standards were improving through an altogether more demanding school inspection regime than had been the case previously. In judging the direction of travel of student achievement and attainment per school, individual educators' teaching performances were scrutinised, assessed, and pronounced upon. Thus, absolutely central to the prosecution of the DfE's strategy to better educational standards in schools was the educational workforce, principally as represented by educators. Consequently, what resulted was a profound, and in the opinion of many, unwelcome and unhelpful changes to educators' roles, working conditions, relationships, and subjectivities (e.g. Ball, 2017; Lewis & Hardy, 2015).

As I have argued thus far, the overarching desired outcomes of the educational reform agenda in England were (substantial) improvements in educational standards and that a raft of organisational educational agencies and policy initiatives and practice directives aimed at changing educators' teaching behaviours were the mechanisms by which successive governments hoped to accomplish this goal. With this premise introduced, I now return to Ball's (2003) trio of policy technologies, namely performativity, managerialism and marketisation. I suggest that an examination of them is an essential precursor to documenting and appraising the conceptual literature on the aforementioned educational agencies and policy and practice directives as I move towards constructing the framework that I will rely upon to interpret the research data. Performativity, managerialism and marketisation are to a large degree imbricated so giving a fully delineated account of each is challenging and very possibly distorting. Nevertheless, it is my judgement that these technologies require careful and separate consideration rather than being collapsed into one, as is often the case in the discourse (e.g. Moore & Clarke, 2016; O'Leary, 2013; Tan, 2008). Accordingly, I present them in one sub-section, beginning with performativity. I have endeavoured to minimise any duplication of ideas across the three policy technologies.

The policy technologies of performativity, managerialism and marketisation

Performativity

The rationale behind performativity is that educational processes and activities can be stripped of their complexity. Once de-rendered and represented by simple classifications and categories, the application of judgment as to the quality of execution of the performance becomes enabled. Performativity thus casts itself as an objective and hyper-rational imperative (Ball, 2017). This seductive proposition has propelled performativity into the working environment of many educationalists globally.

In its most stripped-down and original conception as the "best possible input/output equation" (Lyotard, 1979/1984, p. 46) performativity represents the normative pursuit of efficiency within a/any system (Locke, 2015). Nonetheless, if it was Lyotard who introduced the concept of performativity, it is surely Stephen Ball's writings on performativity that has transformed it into a foundational concept amongst educationalists (Clarke, 2013). Thus, I draw on Ball's seminal 2003 text, *The teacher's soul and the terror of performativity* and the third edition of his book *The Education Debate* (2017) to structure my arguments on the influence of performativity on Westford's educators' teaching behaviours and practice as I move closer towards developing an interpretive framework. There is evidence in the literature to suggest that I am not alone in adopting Ball's (2003) paper to support a conceptual framework. Located within the analogous reform milieu of the United States, Holloway and Brass (2017) write that "using one of the most popular articles published in [Journal of Education Policy] … Ball's (2003) policy studies in England offer useful concepts and empirical analyses to make sense of a transformative decade … in education" (p. 5). Likewise, I considered that Ball's work afforded me with substantial explanatory power in my efforts to provide a cogent account of the operating environment of Westford's practitioners.

After Ball, performativity is;

> a regime of accountability that employs judgements, comparisons and displays as means of incentive, control, attrition, and change. The performances of individual subjects or organisations serve as measures of productivity or output, or displays of 'quality', or 'moments' of promotion or inspection. As such they stand for, encapsulate or represent the worth, quality or value of an individual or organization within a field of judgement (Ball, 2003, p. 57).

Education, as a public service, has not been immune to experiencing the coupling of the "effort[s] of management to the information systems of the market and customer choice-making and/or to the target and bench mark requirements of the state" (Ball, 2007, p. 27). "Powerful agents" (Ball, 2003, p. 215) such as the OECD and the World Bank play a significant role in disseminating the gospel of performativity. Rejection of this "received transmissible paradigm" (Lyotard, 1979/1984, p. 12) is rare, meaning that the practice of performative policies in education systems the world over has become the routine rather than the exception (O'Leary, 2013). Edgington (2016) contends that there are two assumptions behind this ascendency of performativity as a policy imperative. Firstly, that education is perceived to be a "magic bullet" (p. 307). Edgington's second assumption is based on a "prevailing fallacy" (Reay, 2006, p. 291) where the "focus was to be on teachers … and particularly … classroom processes: if we can only make teachers good enough, equip them with sufficient skills and competencies" (Reay, 2006, p. 291). Educators thus found themselves inextricably at the heart of the performativity project where they were invested "with impossible powers of transforming educational failure into success" (Reay, 2006, p. 292).

In practical terms, Moore and Clarke (2017) describe how, "neoliberalism attaches a market value to performance and product 'performativity' – embracing or introducing numerical measures of the 'quality' of such production, such as test and examination scores, or inter-institutional 'league tables'" (p. 676). Educators in England thus experience the phenomenon of performativity through mandatory participation in appraisal meetings, annual reviews, peer reviews, inspections of teaching, quality assurance visits, promotion, and job applications: instances of 'performativity-in-action' have become routine in state-maintained schools now. Their work is underpinned by the copious use of purportedly objective data that attempt to quantify performance in dimensions aligned to outcome measures and targets typically called Key Performance Indicators (KPI). If educators are the conscripted players on the "the field of judgement" (Ball, 2003, p. 216), it is the pitch-side game analysts who offer judgement on the performances using a KPI battery of measures, comparisons, and targets. In response to the purposefully constructed uncertainty around not knowing what counts as an acceptable or even good performance (Shore & Wright, 1999), educators adopt unhelpful or damaging practices. These are underpinned by what Ball contends is "values schizophrenia" (Ball, 2003, p. 221). Is it my contention that these conflicts of interest see educators grapple with the prospect of the consequences of offering authentic performances, versus plastic, cultivated and mechanistic performances whose only purpose is to secure the externally determined outcomes favoured at any given time. Survival in the performative classroom makes the “primacy of caring relations in work with pupils and colleagues” an indulgence of the past (Smyth, Dow, Hattam, Reid, & Shacklock, 2000, p. 140). Instead, the game-playing and cynical compliance called up by succeeding i.e. producing the enacted fantasies (Butler, 1990) or fabrications, can jeopardise educators’ moral well-being. “Ethical retooling” can result in educators experiencing feelings of shame and guilt at their capitulation to performativity (Ball, 2003, p. 226). Worse still, they can be duped into new behaviours and find themselves absent of a professional identity, or the wearer of a professional identify altogether more promiscuous. The performativity project needs and thus creates:

> A new kind of teacher and new kinds of knowledges … a teacher who can maximise performance, who can set aside irrelevant principles, or out-moded social commitments, for whom excellence and improvement are the driving force of their practice (Ball, 2003, p. 223).

Indeed, I suggest that educators’ attraction to and use of brain-based education could be an instantiation of Ball’s theory in that the performativity culture drove them to become pedagogically promiscuous. By this I mean that they were willing to take the risk of overlooking its unscientific basis because its hype offered a prospect of success in terms of sufficing their needs for improved student attainment outcomes.

For educators, another pernicious instance of performativity-in-action is that triggered by the inspection of teaching (Ball, 2003). Since 1992, coinciding with the inaugural publication of the national school performance league tables, under the auspices of Ofsted, schools in England have been subjected to what has been deemed an exogenous high-stakes inspection regime (Page, 2017). To reach a judgement on the school’s performance, a major part of the inspection visit was concerned with the formal scrutiny of’ individual classroom practices[1]. The doxa of performativity (coupled with that of managerialism and marketisation) has now seen to it that the culture of inspection has become fully assimilated in schools. Several types of ‘observations’ (school-speak for inspections) are carried out by school actors with regularity to judge educators’ teaching performance. Educators find themselves and their practice under

[1] The Ofsted practice of grading individual lesson inspections ceased in 2014 (see Ofsted’s School Inspection Handbook, August 2014).

unremitting surveillance. Michael Foucault was a French philosopher whose analysis of Bentham's[2] Panopticon offered a dominant metaphor for understanding contemporary surveillance (Haggerty & Ericson, 2000). His metaphor has since become a 'go-to theory' for educational theorists whenever conceptualisations of accountability and performativity are invoked (Courtney, 2014). I discuss the meaning and implications of this for the participants in the section on Ofsted. What can be surmised here however, is that performativity as a policy technology has been a detrimental imposition on educators (Ball, 2017: Edgington, 2015). Having outlined the key aspects of performativity, I now focus my attention on managerialism, firstly tacking the subject of how notionally they are different.

Managerialism

The ushering in of New Public Management (Hood, 1991), managerialism (Ball, 2003, 2017) or new managerialism (Randle & Brady, 1997) started during the last two decades before the millennium (Cutler, 2007) and there appears to have been no retreat from this neo-liberal advance upon entry to the current century (Bottery, 2000; O'Leary, 2013). Educational institutions and their employees have been obliged to adopt the lexicon and practices of the private sector (Ball, 2003). Ball (2017) suggests that the "transformational force" of managerialism has secured the "cultural re-engineering" or "cultural recasting"' (p. 56) of all public services. Managerialism goes hand-in-hand with the notion of accountability, being based as it is on the information aspects of knowledge rather than the application of judgement (Frowe, 2005). "Intelligence systems" (Cutler, 2015, p. 772) that provide background information that has "no fixed interpretation" are seen as a key component of managerialism (Cutler, 2015, p. 772). Simplistically speaking then, it is this difference that separates managerialism from performativity, although as I have suggested the two constructs are often considered together and hardly ever without the imbricated notion of marketisation (e.g. Bottery, 1998; Clarke & Newman, 1997; Edgington, 2016). Hence some of the following discussion on KPIs overlaps with the discussion of performativity.

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[2] The panopticon was a prison design proposed by eighteenth-century reformer Jeremy Bentham (see Bentham, 1995).

Pollitt (1992) defines managerialism as a policy approach that accepts that increasing economic productivity is the panacea for social progress. Pollitt (1992) further writes that the doctrine of managerialism holds that such productivity can only be achieved by a labour force instilled with the twin ideals of improved productivity and unquestioning adherence to corporate aims. Moreover, managerialism requires managers to be explicitly tasked with achieving the increased productivity and given the freedoms in terms of harnessing all company resources, including personnel, necessary to realise it. Ball (2003) contends that managerialism has swept away the previous policy technologies of professionality and bureaucracy. For professionality, this view finds a consensus (e.g. Bottery & Wright, 2000; Olssen et al., 2004). De-professionalisation is facilitated by managerialism because educators are only "empowered in terms of how they can achieve the goals set, not what the goals might be" (Murgatroyd & Morgan, 1993, p. 121). This is chiefly because the changing approach to public sector 'managing' has caused structural change whereby those who deliver services are fully decoupled or disaggregated from those who possess the strategic power for the related policy decisions (Cutler, 2015). At the delivery end of the public service, educational managers or leaders who are successful in constructing a culture in pursuit of corporate objectives may acquire the status of "cultural hero" (Ball, 2017, p. 56). While these cultural heroes may exercise some constrained autonomy over minor/local decisions the same exercise of self-rule is not afforded to educators. Indeed, the locus of power for significant decision-making appears to have fully shifted away from the classroom educator (Bottery, 2000).

The previously enjoyed autonomy becomes a high-tide marker harking back to the days when educators exercised "major input on the implementation of curriculum, teaching methods, assessment and school management ... [and] the policies on these" (Bottery, 2000, p. 160). The autonomy of "subverting professionals" (Bottery, 2000, p. 67) is thereby fully superseded instead replaced by accountability (Hoyle & Wallace, 2005), control and surveillance mechanisms (Whitty, 2002). Educators are required by their managers to implement the externally imposed agendas, which are primarily about:

> goals and plans rather [than] … intentions and judgements. It is about action rather than reflection. It draws on analysis … rather than synthesis. It sets up boundaries between 'policy' and 'delivery', 'strategy' and 'implementation', thought and action. It offers a technist discourse … so that debate about means supplants debate about ends (Clarke & Newman, 1997, p. 148).

Educators are additionally impeded by the shift towards "punitive managerialist strategies" because such tactics inhibit the vital, personal aspects of teaching and learning conflicting as they do with the "ideology that sees learning as intrinsically emancipatory" (Edgington, 2016, pp. 307-308). It is contended that the surveillance strategies imposed to measure the particularly important and hence mainly external outputs - KPIs – are problematic because they purport to measure what is deemed to be 'best practice' in the classroom (Ball, 2003; Jeffrey & Woods, 1996). Bound up in the underpinning assumptions of performativity already highlighted, KPIs are based on the contestable premise that there is "a straight line" between learning outcomes and educator practice (Skourdoumbis & Gale, 2013, p. 892). KPIs focus educator's attention on pursuing short-term outcomes for their students and this sits in direct conflict with the supposition that meaningful learning can only be acquired over an extended time frame and moreover is difficult to accurately quantify (McQueen, 2014).

With the rise of managerialism, inevitably there are many more KPIs at play in schools and education now, both globally and nationally. KPI-culture sees to it that educators are governed by numbers (Ozga, 2008). The consequence of this is that "We come to make decisions about the value of activities and the investment of our time and effort in relation to measures and indexes and the symbolic and real rewards that might be generated from them" (Ball, 2015, p. 299). Thus, managerialism contributes to the assault on values (Bottery, 2000) and only exacerbates the inevitability of educators being required to cope with ethical dilemmas (Benadé, 2012). With its concomitant deference to the tyranny of numbers (Ball, 2015), often manifested as student scores on national tests and with international comparisons, educators' practices and subjectivities are changed in ways that render them manageable. Having outlined the key aspects of managerialism and explained its imbrication with performativity, I now examine marketisation, the last of the three policy technologies that together have fashioned the operational environment of educators to be the key feature of the English school system it is.

Marketisation

There has a been a substantial layering of the market-orientated reforms in education, particularly in England since their inception in the late 1980s (Exley, 2012). It is equally important to note that there is an underpinning ideology that markets secure improved outcomes, efficiency, and innovation (Lubienski, 2009). Apple (2005) explains how this ideology is essentially neo-liberal and that its prevailing justification is "that by making the market the ultimate arbiter of social worthiness, this will eliminate politics and its accompanying irrationality from our educational and social decisions. Efficiency and cost-benefit analysis will be the engines of social and educational transformation" (p. 276). The primary impetus of such reforms is to establish a split between the purchaser and providers of public services with the purpose of creating competition between providers. Le Grand (2011) asserted whilst the markets thus created shared some characteristics with natural markets, these public service markets were in some important regards artificial and required the clarification of 'quasi'. A natural or "pure" market arises "where utility-maximising consumers purchase products out of their own private resources from a range of goods and services supplied by private, profit-maximising, competitive providers" Le Grand, 2011, p. 80). Perhaps that education has only suffered quasi-marketisation is unsurprising given Sayer's analysis that all markets, are to a greater or lesser degree quasi, since "markets are social constructions whose birth is difficult and requires considerable regulation and involvement by the state" (1995, p. 104).

Despite this, the phenomenon of marketisation in education is not unique to England and has been observed across a wide number of countries (Pollitt & Bouckaert, 2011). Ostensibly it is associated with on one hand, the broader economic, cultural, and political processes of globalisation and on the other hand, post-Fordism and postmodernity (Whitty, 2002). Postmodernity is an intellectual movement that became popular in the West in the 1980s (Giddens & Sutton, 2017). Essentially, it is a type of scepticism directed at authority: primarily, it aims to undermine "theoretical frameworks claiming ultimate truth or knowledge" (Howell, 2013, p. 103). Marketisation has changed relations between and within schools in many ways. Through the application of market forces, students and their parents are recast as consumers and the schools as producers (Whitty, 2002). The accompanying belief is that a "competitive dynamic" (Ball, 2017, p. 54) will be forthcoming and that this competitiveness will drive up standards. However, for competition to be the catalyst for improved educational outcomes, parents and students need to assume their role as the discerning consumer of educational provision. They can only do this effectively if they have free and unfettered access to apposite information about the notional providers in the marketplace. This performance information should of course, be of high quality and facilitate straightforward use by its prospective consumers (Collins and Coleman, 2017). It is the twin policy technologies of managerialism and performativity that generate such data. Typically, in England, this data takes the form of Ofsted reports, performance league tables and the like (McLaughlin, Osborne, & Ferlie, 2002).

The interpretation of this data by outsiders can be problematic because there is a flawed assumption that comparability exists across contexts, institutions and over time (Ball & Youdell, 2008). Frequently this leads to a blame-culture, where poor standards are attributed to educators and schools (Reay, 2006). In such instances, educators "'want' what the system needs in order to perform well" (Lyotard, 1984, p. 62). Thus, typically they experience revised roles becoming "entrepreneurs for a system" (Scott, 1996, p. 104). This assessment fits Willmott's (1993) prediction that behaviour in a competitive environment, changes because "employees are simultaneously required … to recognise and *take responsibility for* [original emphasis] the relationship between the security of their employment and their contribution to the competitiveness of the goods and services they produce" (p. 522).

This concludes the examination of marketisation. It is somewhat shorter than the preceding accounts of performativity and managerialism. This is because, as I said earlier, the three policy technologies significantly overlap with each other. Much of the ideological groundwork for marketisation has thus already been prepared in my examination of performativity and managerialism, and its further duplication would not be helpful. I next proceed to suggest how together the three technologies were translated from these macro-level policy concepts into dominant classroom-level teaching initiatives and ideas by exogenous education agencies whose sole raison d'être was to effect a system-wide improvement in student outcomes by making educators' teaching practices more efficacious. In other words, I next describe and explain the operational environment that these policy technologies created, as it would have manifested itself to Westford practitioners at the level of the classroom in the time-period prior to the data collection in April 2013.

Powerful agencies, initiatives, and teaching ideas that shaped models of practice and drove teaching behaviours

As suggested, the operational environment that contemporary educators occupy is the product of the convergence of the emphasis on improving the 'performance' of public sector services (performativity), the increased use of competition in the public sector (marketisation) and related changes in the approach to 'managing' public sector organisations (managerialism) (Cutler, 2015). Ball (2017) concludes that the trio of policy technologies act as exemplification of the direction of travel from governing to governance (Rhodes, 1996). Moreover, Ball (2017) asserts that they have brought about "new values, new relationships, and new subjectivities" within the educational endeavour (p. 48). There have been profound and for some, unwelcome changes in the way the thus regenerated state carries out its policy business in the educational arena as this seemingly inexorable progress towards "metagovernance" proceeds (Jessop, 2002, p. 242). It seems beyond contestation that in England, the state's role in policy enactment "is now dependent upon a vast array of state and non-state policy actors" (Marinetto, 2003, p. 599). Inhabiting the blurred "borderland between the public, private and voluntary sectors" (Ball, 2009, p. 101) one finds a complex and intertwined array of state, non-state and quasi-state agencies and actors whose relationship to each other and to the state is characterised by heterachy rather than hierarchy. The collective and additive effect of these entities on the policy process serves to validate new policy discourses and facilitate their transmission thereby enabling new forms of policy influence and enactment. Mutually, they make up "new policy communities" (Ball, 2009, p. 100).

In many ways, these are like organisational versions of Bennett's (2004) cultural players because they "possess particular forms of power resources which they have acquired by first deferring to particular norms and then developing, articulating and sustaining a particular interpretation of them" (p. 112). A non-exhaustive but critical list at the time of data collection includes the NS, the National College for School Leadership (NCSL), the Training and Development Agency for Schools (TDA), the Qualifications and Curriculum Authority (QCA), Ofsted, and SSAT[3]. What is of importance here, is that all these entities are all non-departmental government bodies with significant power to shape educator's teaching practices to accord with their own and governmental agendas. Although a relatively small group, it is characterised by "bureaucracy and administrative structures and relationships with a system of organisation replete with overlap, multiplicity, mixed ascendancy, and/or divergent-but-coexistent patterns of relation" (Ball, 2009, p. 100). Consequently, I have found it inordinately difficult to separate out the individual contributions of these agencies in directing educator's teaching practices. I have adopted the view within this group, the two that that have had the most influence are Secondary National Strategies (SNS) - the division of NS for secondary schools - and Ofsted. My rationale is that these are the only two agencies that have had direct

[3] The NCSL, SSAT and the TDA have undergone structural and/or name changes during their lifetimes. These titles and roles were accurate at the time of data collection.

involvement in any orchestrated and sustained way in schools. By this I mean that SNS and Ofsted relatively routinely engaged with the teaching workforce through proximal, face-to-face encounters in classrooms where teaching was the focus of the interaction. The other educational agencies worked with specific groups of educators and/or assumed a more distal and less instructional working relationship with them.

I faced the same dilemma in considering which of the plethora of the government's teaching initiatives and ideas had similarly re-orientated educators' teaching behaviours so that they better reflected the agenda of prevailing neoliberal policy technologies. As I will explain, my view was that the most influential initiatives were PL and what works/EBP. Similarly, I took the stance that the most influential teaching ideas, or elements of practice consisted of the three-part lesson, behaviour for learning, progress, differentiation, and best/good practice. I begin with an account of the two agencies followed by the two initiatives. I nest the presentation of each teaching idea within the discussion on the organisational cultural player or initiative that has in my consideration, been the most implicated in its development and propagation. This decision means that I discuss intervention, the three-part lesson and behaviour for learning, in the section on SNS, progress in the section on Ofsted, differentiation in the section on PL and best/good practice in the section *What works/ EBP*.

Secondary National Strategies

The New Labour government introduced the NS almost at once after their election in 1997. It was launched as an early illustration of their commitment to "education, education, education" (Gillard, 1996, para. 2). Although its origins were modest, after the event, it portrayed itself as "one of the most ambitious change management programmes in education" (DfE, 2011, p. 2). It was arguably the first national systematic and sustained attempt at raising academic standards by improving the quality of teaching in schools. Borrowing the voice of its two key protagonists, "The National Strategies are professional development programmes for early years, primary and secondary school teachers, practitioners and managers" (Capita, 2009, para.1) that provide "training and targeted support to teachers through a three-tier delivery model, comprising the DfE and its national field force, local authorities deploying their own advisers and consultants, and then schools and settings" (DfE, 2011, p. 2). Initially the priority of NS was the betterment of basic standards in primary schools. By 2001 NS's remit was expanded into the secondary and early years phases of schooling. SNS improvement programmes first encompassed the core subjects of English, Maths, and

Science at Key Stage 3 (11 to 14-year olds). *The Key Stage 3 Strategy* was quickly extended to Key Stage 4 (15-16-year olds). At the heart of SNS was the goal to "raise expectations by increasing pupils' confidence and levels of engagement and by strengthening the quality of teaching" so it became all "about classrooms and what goes on in them" (DfES, 2003, p. 3).

In 2008, SNS were charged with implementing the *National Challenge*, a country-wide initiative aimed at ensuring that all secondary schools met the then floor target of 30 per cent five or more GCSE or equivalent passes at grades A*-C including English and Maths GCSE by 2012 (Bolton, 2010). Westford LA had 50 per cent (seven) of its secondary schools in the National Challenge and of these four schools were performing below 20 per cent. In terms of rankings for the floor target KPI, Westford LA was the seventh worst (n=151) in England.

Table 3.1: Influential SNS teaching ideas

SNS ideas	**Description**
The three-part lesson	One of the key themes of SNS' work with educators was to develop their ability to "focus and structure their teaching so that pupils are clear about what is to be learned and how, and how it fits with what they know already" (DfES, 2003, p. 3). Secondary educators, firstly in the core subjects, latterly everyone, received SNS PD on the use of starters, mains, and plenaries to "engage pupils and help them make sense of their learning" (DfES, 2002, p. 4). The three-part lesson (or one of its close variants (see DfES, 2002, p. 21-22) became an essential element of an effective lesson. Educators were heavily encouraged to adopt this format for lesson planning and delivery. Lessons that had multiple mains and/or mini-plenaries i.e. many episodes that separated the learning into distinct stages or steps were called episodic lessons (DfES, 2003).
Behaviour for learning	The KS3 NS Behaviour and Attendance (B&A) strand was introduced to combat concerns about the negative impact that poor student behaviour and attendance was having on the wider efforts of the NS to effect improvements in learning outcomes (Ellis & Tod, 2005). Behaviour acquired a high status although according to Maguire, Ball, and Braun (2010) it was only a medium specificity policy imperative. Amongst wider and more whole-school orientated considerations of the link between behaviour and school improvement, the B&A SNS strand clearly signalled that the solution for the eradication of problematic behaviour lay in *using* effective teaching rather than solely pursuing behaviour management *for* teaching (Ellis and Tod, 2005).

	Educators were told that "Few, if any, classroom management issues arise when pupils are properly engaged" (DfES, 2004b, p. 1). An influential example of this was the SNS *Pedagogy and Practice: Teaching and Learning in Schools* (DfES, 2004a) which consisted of 20 units of PD materials covering all aspects of what was deemed to be effective teaching. There were 3 units devoted to "Creating the conditions for learning". Ostensibly together they constituted a how-to guide for implementing behaviour for learning. Advice offered included the use of learning styles (predominantly VAK and Multiple Intelligence theories), paying attention to the physical environment to complement standard behaviour management techniques. Reinforcing this drive for better quality teaching, where poor behaviour was to be reframed entirely as a symptom of ineffective teaching was the inspection regime. Judgements were made about whether students enjoyed their lessons and behaved well (Ellis and Tod, 2005). At the time of data collection, behaviour for learning formed one of Ofsted's key judgements (see later).

As the remit for SNS' work with LAs and schools continued to broaden over time, centralised KPIs anchored to the improvement of academic standards were established for nearly all aspects of their work. These were passed onto LAs, who in turn passed them onto individual schools: schools passed their targets onto educators. Thus, there was in principle at least, a simple linear chain of accountability established from the classroom to education ministers. By their eventual dissolution in 2011, NS/SNS had transmogrified from its relatively small, focused, and effective origins into a behemoth that was involved in almost all aspects of schools' teaching activities. In 2010 there were "111 separate National Strategies' programmes devised to improve outcomes in secondary schools" (Ofsted, 2010, p. 10). "The rapid pace of the introduction of new initiatives reduced the potential for the [LA] consultants and the materials to have an impact on standards" (Ofsted, 2010, p. 14). Some of the more notable of these well-resourced, powerful, and pervasive ideas about teaching that Westford's educators would have had contact with included the three-part lesson and behaviour for learning. The accounts of these given in Table 3.1 are of necessity, indicative rather than definitive.

Ofsted

I previously introduced Ofsted in its role an inspectorate of schools as a special instance of performativity-in-action. Here, I provide a closer analysis of Ofsted and its modus operandi to further contribute to the emerging account of Westford's practitioners' operational environment and more specifically to explain how Ofsted directly and arguably deliberately influenced the practitioners' teaching behaviours. Since its inception in 1992, Ofsted's role and responsibilities in relation to inspecting schools has been developed by a succession of legislative acts (Baxter & Clarke, 2013). The newly empowered neoliberal institution of Ofsted (Baxter, 2014) irrevocably recalibrated the relationship between the construction of accountability and how it was operationalised (Courtney, 2013) as I shall now demonstrate.

The 'espoused' aim of any Ofsted inspection is to judge the overall effectiveness of schools. Consistent with managerialism, "rational, highly engineered frameworks" (Baxter, 2014, p. 22) which are underpinned by statistical absurdity (Coffield in Belgutay, 2017) are always used during and before the inspection to 'direct' the inspectors' judgements. These inspection frameworks are normally updated approximately every 4 years. Atypically however, there were a series of relatively major revisions from 2011-2012 in the period leading up to the data collection phase. The most notable of these revisions or "structural changes" (Courtney, 2014, p. 624) happened in the January 2012 framework, where the judgments were reduced from 27 to five key areas, all but one of which directly implicated classroom teaching practices. In September 2012 under the guise of a consolidation exercise -whereby the previous multiple guidance books for school inspections, namely the *Evaluation Schedule for the Inspection of Maintained Schools and Academies* and *the Framework for School Inspection* were merged into the *School Inspection Handbook* - further substantive revisions were enacted. Thus, the inspection framework operant during data collection was the single, overarching *School Inspection Handbook* (September 2012) *(Ofsted, 2012a).* Subsequently, there have been a number of alterations to Ofsted's inspection guidance. Perhaps the most notable revision in the context of this discussion occurred in 2014 when although individual lessons continued to be observed so that a whole-school judgement of teaching quality could be made, the individual grading of them ceased (see footnote 1). For clarity, the ensuing discussion only draws on the Ofsted guidance and activities that prevailed at the time of data collection.

Nominally, Ofsted inspects schools but to do this inspection teams visit lessons to evaluate the quality of teaching, nonetheless "in reality the teachers feel that they themselves are being judged" (Elton & Male, 2015, p. 414). Empirical evidence affirms that lesson inspections cause damage to inspectee's affective domains before, during and after the live inspection event (Brimblecombe, Ormston, & Shaw, 1995; Perryman, 2007, 2009). Even if educators can somehow insulate themselves from the prospect of the likely actual emotional turbulence and trauma, and take measures to avoid the nocebo effect, every Ofsted inspection event also comes with a substantial professional 'purse' to be either won or lost based on judged performance. Being pronounced as an outstanding or a good educator afterwards confers an important and elevated status on its recipients. As a "triumphant self" the educator is granted access to the "ever expanding ranks of the executors of quality" and hence can reap the rewards of being "a new kind of professional" (Ball, 2003, p. 218). Conversely, because it is in the interest of the performative system to keep its processes "volatile, slippery and opaque" (Shore & Wright, 1999, p. 565), educators graded at the lower end of the scale are destined to experience "ontological insecurity" (Ball, 2003, p. 218). Teachers inhabit a space where their "capacities, conduct, statuses and duties … are problematized and worked on" (Dean, 1995, p. 565). Because they lack meaningful access to the underlying basis of the judgement criteria, although the responsibility for it is firmly laid at their door (Willmott, 1993), they are likely to find themselves struggling to effect the expected 'improvement'. Regardless of the classification awarded by Ofsted for teaching prowess, to get up to 'standard', and thereafter to maintain it requires, as well as the more obvious investment of considerable time and effort needed to recalibrate classroom practice, "intensive work on the self" (Dean, 1995, p. 581).

I now develop Ball's (2003) notion of ontological insecurity in the context of the Foucauldian metaphor of the Panopticon and the related ideas of panoptic performativity (Perryman, 2006) and post-panopticism (Courtney, 2014). This is because together they appear to hold significant explanatory power for this research. Of these, Courtney's argument is especially attractive and unusual in that he seeks to expand the conceptual framework of panopticism that is based on Foucault's popular invocation of Bentham's Panopticon. Germane to this research, Courtney argues that the turn from panopticism to post-panopticism in school inspections occurred just prior to the data collection phase. Although Ofsted rationalised the revisions that were crystallised in the September 2012 *School Inspection Handbook* thus, "We believe that we can raise expectations further by challenging and supporting schools through inspection" (Ofsted, 2012b, p. 2), Courtney disagreed. To him, the rapid succession of adjustments culminating in the September 2012 *School Inspection Handbook* represent shift from a panoptic regime to a post-panoptic regime because the prime purpose of the modifications was to deliberately create insecurity and instability, in other words to "wrong-foot school leaders, disrupt the fabrications they have constructed to withstand the inspectors' gaze, and make more visible the artifice of the performances that constitute their identities" the panoptic drive for compliance is replaced with the post-panoptic aim of exposing "their constructed and differential 'incompetence'"(Courtney, 2014, p. 624). This brief explanation of post-panopticism, its manifestation in the September 2012 *School Inspection Handbook* and its implications for the Westford practitioners will be revisited. Before this, I explain the ideas behind panopticism more fully.

The purpose of a Panopticon is to remediate its prisoners' behaviour by tricking them into believing that they are under constant surveillance. The ensuing and altogether more favoured behaviours, transpire because the prisoner, would be "Consciously visible, known and judged" (Courtney, 2014, p. 626). Foucault (1977) hypothesised that the subject would "assume … responsibility for the constraints of power; … make … them play spontaneously upon himself; he inscribes in himself the power relation in which he simultaneously plays both roles; he becomes the principle of his own subjection' (pp. 202–203). Perryman (2006) asserted that the way educators experience inspection regimes could be modelled using the idea of panoptic performativity. Panoptic performativity occurs when educators try to escape the inspectors' gaze by performing when inspected according to the norms that are expected of them – "this means that lessons are taught in a particular way and school policies and documentation reflect the expected discourse"' (Perryman, 2006, p. 5). Inspection doubles as a powerful mechanism by which successful practice is both prescribed and measured. It acts to mould the pre-performative educator into their performative avatar – a system-compliant image of themselves that performs however and whenever necessary in accordance with whatever the discourse of what constitutes a good educator in the inspection framework happens to be at any given time. These fabrications, as Ball (2003) enunciates are:

> versions of an organization (or person) which does not exist - they are not 'outside the truth' but neither do they render simply true or direct accounts - they are produced purposefully in order 'to be accountable'. Truthfulness is not the point - the point is their effectiveness, both in the market or for Inspection or appraisal … Teachers are required to produce measurable and 'improving' outputs and performances, what is important is what works (pp. 222 & 225).

The regimes of performativity, managerialism and marketisation have been fully accepted as the operational environment's dominant discourse. Accordingly, its required behaviours seem to have been internalised by its educators. Normalisation has occurred since the educator has been educated into the modes of successful practice (Perryman, Maguire, Braun, & Ball, 2017). Educators have been transformed into perfect prisoners (Perryman, 2006) believing themselves under constant surveillance. They are selfmonitoring, self-correcting and in a state of perpetual readiness for the next inspection. Fundamentally, panoptic performativity is about the idea that educators become self-governing and that they police their practice according to whatever the extant inspection framework tells them a good educator is and does using models of practice that work. With panopticism and panoptic performativity clarified, I next address the construct of post-panopticism.

As Courtney (2014) chronicled, in the short space of about nine months, three radical and at times contradictory versions of the 2012 inspection framework were published by Ofsted. If being bombarded with three inspection frameworks in quick succession wasn't problematic enough for Westford's practitioners, what surely must have caused severe inspection dissonance was the incongruent nature of the actual modifications. While any inconsonance may have disappeared with the adoption of the final variant, the purposeful – it is claimed - ambiguity did not, as I shall illustrate now with empirical evidence. In the 'final' September 2012 *School Inspection Handbook*, the quality of teaching and student behaviour were afforded substantially more prominence in the final judgment decision process (Ofsted, 2012a). More pertinently though, with implications for this research, the replacement of the category of 'satisfactory 'with 'requires improvement' meant that the framework was considerably tougher on academic standards (Baxter & Clarke, 2013). Elton and Male researched one of the very first primary schools in England to undergo a 'September 2012 inspection'. They documented the experiences of the staff as the school progressed through the Special Measures inspections regime necessitated by virtue of being classified as inadequate (Grade 4). The subsequent Special Measures inspections were carried out by a collection of actors and agencies, some internal, but most were external but local to the school. Each lesson inspector interpreted the 2012 School Inspection Handbook, as it related to assessing the quality of classroom teaching, in a highly 'individualised' way. This left the educators in this study reporting that they had "been buffeted around by rapidly changing notions of 'what is right' and 'what works'… they had effectively lost their pedagogical compass and professional confidence" (Elton and Male, 2014, p. 415).

I have reproduced the key parts of the prevailing Ofsted guidance relating to the inspection of the quality of teaching in Figure 3.1. I have added my own emphasis to highlight where I consider where the purposeful ambiguity that allowed these inspectors to pronounce in markedly diverse ways from each other may have originated. I propose that the effect of this 'calculated wriggle-room' caused the educators to experience what I call ‘pedagogical gaslighting’. In ordinary parlance, gaslighting means the deliberate psychological manipulation of someone in order to destabilise them and delegitimise their beliefs. Primarily, the purpose of gaslighting is to cause doubts about what constitutes reality. The notion of pedagogical gaslighting, from my perspective aptly captures the idea that being exposed to alternative interpretations of the Ofsted guidance, had caused the educators studied to seriously distrust their hitherto successful/acceptable teaching prowess. Not only did this pedagogical gaslighting call into question educators’ teaching abilities, it sowed seeds of doubt about everything that underpinned them including the educators’ knowledge, experience, status, and self-esteem. In other words, since the educators had been so pedagogically disorientated, leaving them at the very edge of their ‘teaching sanity’ they had experienced pedagogical gaslighting.

On the topic of teaching, the reworked September 2012 *School Inspection Handbook* keeps the door open to charges of obfuscation, slipperiness, and obliqueness. As Figure 3.1 confirms, this calculated wriggle-room, which cannot be anything but intentional, presents itself a myriad of ways: additively, the individual instances serve to amplify the lack of clarity over what defines an acceptable performance. In the first instance, there is overt reliance placed on the contested constructs of professional judgement and professional knowledge (Baxter and Clarke, 2013). This is compounded by the vagueness surrounding the basis of the sources of evidence the inspectors can call upon. Further compounding arises because the inspectors are also enabled to make contingent interpretations of grade descriptors and the evidence. Whilst decision-making processes are notoriously complex and therefore are difficult to definitively pronounce upon (Taylor, 2006), and not only is there an absence of a very direct and clear relationship between the evidence and the judgement in the framework but the imprecisions and abstractions that pervade the judgment descriptors and the evidence descriptors only further diminish the clarity of this relationship. Those in the preparation and compliance industry for Ofsted inspections have found themselves wrongfooted by this too (Espinoza, 2015). Even Ofsted inspectors fare little better and have had their field judgments turned over occasionally (Baxter and Clarke, 2013).

27. There are many different strategies for planning observations... inspectors should not be constrained by a single approach but should use their *professional judgement* .... For example, inspectors may engage in:

- short visits to a number of lessons...
- short observations of small group teaching...
- lesson observations of more than 25 minutes
- longer observations of an hour or so...

90. The evaluation schedule sets out the sources of evidence and grade descriptors that guide inspectors in judging the quality of education .... The schedule is *not exhaustive* and does not replace the *professional judgement* of inspectors. It is *interpreted within the context of each school* [italics are my emphasis].

Figure 3.1: Excerpts from the September 2012 School Inspection Handbook illustrating the guidance relating to the inspection of the quality of teaching (Ofsted, 2012a, pp. 10-22)

For educators, not really knowing what Ofsted, or indeed other inspectors, were looking for in lesson inspections was one thing, and knowing how they then used this observational evidence to make their judgements was another. Both conspired to inflict at least temporary pedagogical gaslighting and panoptic performativity on the inspected. The situation in Westford prior to the data collection seemed to accord most favourably with the notion of post-panopticism. It is my conclusion that fully pre-meditated, post-panopticism provides an establishment antidote to the embedded educator responses of transient gameplaying, fabrications and compliance. Westford's practitioners found themselves in a "matrix of uncertainty" (Courtney, 2014, p. 638), where what counted as teaching success was kept purposively flexible and fleeting. Essentially the inspection regime was in flux and riddled with ambiguity and "fuzzy norms" (Courtney, 2014, p. 621), whose only raison d'être was to engender permanent and deeper responses, to identify incompetence and expose failure. Clearly, to conclude my examination of Ofsted, their claims to:

> be clear to all ... use telling examples drawn from the evidence base (of the inspection) to make generalisations understandable and to illustrate what is meant by 'good' or 'poor' (Ofsted, 1999).

were perhaps somewhat disingenuous to Westford's practitioners in their post-panoptic world. I next examine how, through Ofsted particularly, the practitioners of Westford teaching behaviours and models of practice would have been influenced by the construct of progress.

Progress

As I have said before, perhaps *the* key idea associated with Ofsted and its inspection framework is that of progress. To reiterate, this notion has been championed/propagated/developed by other educational organisations at various times, but I have selected to deal with it here. The account of progress that ensues will be of necessity, indicative rather than definitive.

I have reproduced some of the apposite points from the September 2012 *School Inspection Handbook* in Figure 3.2 to illustrate two significant issues about progress. Firstly, that the definition of progress is anchored in terms of national student outcomes. Secondly, that because educators and "schools change their practices to conform to what they think the inspectors inspect" (Earley, 1998, p. 172), building on the idea of 'Quality First Teaching' (i.e. getting the teaching 'right' first time), the notion of progress is central to the act of teaching. Being required to demonstrate progress and attainment to secure a favourable Ofsted outcome has had a clear effect on schools' practices (Maguire, Ball, Braun, Hoskins, & Perryman, 2011; Perryman et al., 2017). Not only is the concept of progress bound up with that of attainment, both are equally related to assessment.

Davis (2015) asserted that educators in a high-stakes assessment regime tended to 'teach to the test', i.e. focus all their efforts on teaching only what is required to pass the assessment and neglect the broader aspects of the subject specification. Teaching to the test is arguably another form of a fabricated performance, and as such it is often referred to as 'gaming'. In this instance, gaming or strategic behaviour is a type of educator behaviour that aims only to increase attainment without achieving real gains in student cognition. Davies (2015) argues that teaching to the test damages teaching and learning. Gaming is not the same as cheating, rather, an extreme form of incentivisation, around in this instance, the maximisation of student attainment. The wider concept was first introduced in the seminal book *Freakonomics* (Levitt & Dubner, 2005) but Foley and Goldstein contend that education is rife with gaming. Achieving and demonstrating progress, given its equivalent high-stakes nature is also subject such undesirable types of behaviour. This is exacerbated by the high bar set by Ofsted for what counts as outstanding and good progress.

97. Inspection is primarily about evaluating how well individual pupils benefit from their school. It is important to test the school's response to individual needs by observing how well it helps all pupils to make progress and fulfil their potential.

105. Inspectors must take account of:

- the learning and progress of different groups of pupils

- pupils' progress in the last three years … Evidence gathered by inspectors during the course of the inspection should include: the proportion meeting and exceeding expected progress from different starting points compared with national figures.

- pupils' attainment in relation to national standards (where available) and compared with all schools, based on data over the last three years, noting any evidence of performance significantly above or below national averages; trends of improvement or decline; and inspection evidence of current pupils' attainment using a range of indicators, including where relevant.

Figure 3.2: Excerpts illustrating the definitions of progress from the September 2012 School Inspection Handbook (Ofsted, 2012a, pp. 22-29) and how they inspect for progress

To be considered an outstanding educator by Ofsted meant that, "the proportion of pupils making and exceeding expected progress was high compared with national figures. Quantitatively, expected progress was defined as "three National Curriculum levels of progress between Key Stages 2 and 4" (Ofsted, 2012a, p. 31). To be classed as a good educator, the proportion of students making or exceeding expected progress must have compared favourably with national figures. An educator would have been judged inadequate if there was consistently less than expected progress. In isolation these criteria were challenging, but they took on a more menacing complexion because inspectors also judged the 'real-time progress' made by students during inspections of teaching. For Westford's practitioners' inspections under the September 2012 *School Inspection Handbook* could have lasted for a little as 20 minutes: during this very short time they would be expected to demonstrate at least expected progress for almost all of their students in order to escape an inadequate rating. If "effectiveness in teaching is not defined on the basis of what they do as teachers. Rather, it is defined by what their students are able to do" (Guskey, 2007, p. 20), creating and showing progress for Westford's practitioners became both a testing and exigent teaching matter.

This concludes my analysis of Ofsted's influence on Westford's practitioners teaching behaviours. In the following section, I discuss the two-influential teaching initiatives of what works/EBP and PL.

What works/ EBP

This section builds on Chapter 2's discussions of neuroeducationalism's attachment to scientism and the consequential calls for education to adopt EBP and more extremely, a science of learning. The government's recruitment of the high-profile advocator of the scientific method, Ben Goldacre, to advise them on how educational research could be better formulated and directed to support educational policy signalled a rehabilitation of the old idea of an 'educational science'. When first touted as a failsafe for perfecting educational efforts back in the 1970s and 1980s, it received a lukewarm reception from leading academics. Nisbet said that to think that research could solve the problems of education was 'naïve'' because the relationship between policy and research is only ever indirect (1974). Nevertheless, as a response to the governing managerialist, marketist and performative thinking modalities, evidence-based policy making has increasingly become the espoused mantra of recent government strategists. Specifically, and of the same mind as neuroeducationalists, policy-makers are keen to emulate the 'better' and more 'successful' medical/scientific model for policy decision-making processes (e.g. Wiseman, 2010). With the notion that educational research should recalibrate itself to answer questions of what works firmly resurrected as necessary and viable in the minds of contemporary politicians, policy-lobbyists, learned subject associations and influential academics, educators found themselves at the front of another significant policy initiative that has been influential in framing models of practice.

For educators the educational science rhetoric plays out as a normative discourse about EBP or in the practitioner literature, evidence-informed teaching (Petty, 2009). Frequently, the more rudimentary what works is adopted as the preferred variant by educators themselves. Much like PL, EBP demonstrates the characteristics of an "orchestrating label" (Cribb & Owens, 2010, p. 310), something in principle that is a good idea, intentionally designed to create consent and consensus. Many involved in the schooling enterprise are keen to espouse that they have adopted practice whose efficacy has been ratified by research (e.g. National Audit Office, 2015; Petty, 2009). Becoming an evidence-informed practitioner, at least in principle, was within the realm of possibilities for Westford's practitioners because the English education system has become "evidence-rich" (Collins & Coleman, 2017, p. 21). Not only does it benefit from substantial macro-level provision but at the micro-level, evidence meta-syntheses, like Hattie's (2009) *Visible Learning* and Marzano's !998) *A Theory-Based Meta-Analysis of Research on Instruction* are readily available and hugely influential. These two research products, as do the outputs of the larger research-for-use houses, come replete with high usability and appeal, being as they are, aimed at educators and schools for whom the focus on accountability and a high-stakes external inspection regime has apparently exerted an unrelenting pressure on them to "find quick fixes" (Godfrey, 2016, p. 4).

EBP as a construct, is predicated on the notion of effective interventions, (e.g. Evans & Benefield, 2001; Slavin, 2002). Thus, being a causal model of professional action (Burton & Chapman, 2004), its research methods are limited to those which can demonstrate causation between any given educator intervention and the desired effect. However, effectiveness is an instrumental value since it does not decree what the desired effect should be (Biesta, 2007; Sanderson, 2003). Moreover, desirability is contingent on value (Biesta, 2010). In the practitioners' operational environment, the desirable causal effect is unequivocally an improvement in standards since this is what is valued. An effective intervention then, is one that is based on high-quality, pertinent knowledge which causes improved student outcomes (Brown, Stoll & Godfrey, 2017). Biesta (2007) considers that the model of professional action implied in EBP is not appropriate for the field of education arguing that "education is a moral practice, rather than a technical or technological one … [like] Aristotle's distinction between phronesis (practical wisdom) and techne (instrumental knowledge)" (p. 10).

On this premise, best practice and good practice become inextricably bound up in the dominant discourse about the type of practice i.e. interventions that would bring about improvements in students' academic outcomes. The implications of this for those in the English school system, was that what was designated best or good became, by virtue of the underpinning value system and its focus on the improvement of standards, also 'effective'. Hence, in the lexicon of teaching, best/good practice or teaching was used synonymously to mean effective practice/teaching. In other words, best/good practice were only those teaching behaviours or elements of practice that raised standards, or least were perceived to raise standards. The mantra of best/good practice was taken on by many educational agencies. Arguably though, it was SNS and Ofsted who, using the mechanisms of PD and inspection respectively, played the most significant role in disseminating and reinforcing this normative and aspirational ideal amongst Westford's practitioners. Undoubtedly then, at the time of data collection, I suggest that demonstrating best/good practice would have been one of the key drivers of teaching behaviour for Westford's practitioners.

Personalised learning

Much like what works/EBP, PL was a large-scale teaching initiative whose main purpose was to improve academic standards. According to the rationale of PL, this could only be achieved if teaching was structured to better match the individual needs of the students i.e. if they personalised the learning. Thus, the key teaching idea associated with PL was perhaps that of differentiation. PL is about the provision of an ongoing malleable and individualised educational experience for every student. Exuding benign and non-contentious messages of consumer choice and flexibility, like EBP, PL has been described as an orchestrating symbol (Cribb & Owens, 2010). PL as a discrete and flagship initiative was presented by New Labour in 2008 in *Personalised Learning – A Practical Guide* (DCSF, 2008). By this time, enveloped by the surrounding policy perspective squarely predicated on improving school standards, the policy rationale had transmogrified from concerns about ameliorating privatisation to seeing it as purely in terms of another vehicle for propagating the former. An early and particularly influential definition of PL holds that it is a:

> highly structured and responsive approach to each child's and young person's learning, in order that all are able to progress, achieve and participate. It means strengthening the link between learning and teaching by engaging pupils … as partners in learning (Teaching and Learning in 2020 Review Group, 2006, p. 8).

This forceful assertion goes to show how, that of the many involved in PL (Campbell, Robinson, Neelands, Hewston, & Mazzoli, 2007; Hartley, 2007), ultimately, it was those from the school standards stable who in the long run managed to define the parameters of the debate. Performativity and accountability were placed at the core of the 'official' understanding of PL that went out to schools, as the following excerpt from the PL text from the DCSF (2008) testifies:

> Personalised learning is central to a school improvement agenda which has teaching and learning at its heart …. The pedagogy of personalisation is distinguished by the way it expects all children and young people to reach or exceed national expectations, to fulfil their early promise and develop latent potential. Planning for progression and differentiation are fundamental. High expectations of progress apply equally to children ... teaching and learning is

> characterised by ambitious objectives, challenging personal targets, rapid intervention to keep pupils on trajectory and rigorous assessment to check and maintain pupil progress (p. 7-8).

Taking advantage of the network relations afforded by the de facto heterarchy of the educational cultural players, initially, considerable funding for PL at school level (Sebba, Brown, Steward, Galton, & James, 2007) occurred over a sustained period. Wellington and Ireson (2012) note that in terms of the successful implementation of a personalised approach, the co-operation and involvement of educators were considered pivotal. Thus, hailed as "A 'Big Idea' for school education in England" (Teaching And Learning Research Programme, 2004, p. 4) and sharing some policy synergy with the much grander Every Child Matters agenda, thus for a time it become one of the foremost policy discourses aimed at schools and educators. It is perhaps not unsurprising to find that PL has been described as a vague concept (Hartley, 2007), having one foot in 'personalisation' and a second in 'learning', themselves two contested and nebulous concepts. Subsuming notions of other vague educational constructs that were similarly proffered as good ideas - independent learning, child or student-centred learning and ownership of learning (Meyer, 2010) - it acquired the status of somewhat of a conceptual hybrid, simultaneously needing, and being open to interpretation. As an example of a shallow form of policy enactment (Leadbetter, 2004), PL has had "marginal or nuanced rather than immediate and obvious" effects in schools (Maguire, Ball, & Braun, 2013, p. 336). It has five key components, namely assessment for learning, effective teaching and learning, curriculum entitlement and choice, school organisation and beyond the classroom (Sebba et al., 2007). Unable to isolate these components from each other, the text *Personalised Learning - A Practical Guide* (DCSF, 2008) encouraged schools and educators to operationalise these across a range of existing classroom and wider school provisions/activities. Of these nine areas, the learning environment (i.e. behaviour for learning) has previously been implicated as being a powerful influencer on Westford's practitioners teaching behaviours. The methodology of PL draws on diverse practices including differentiation, L2L, learning styles, curriculum design, outreach and engagement, student voice and group work. Maguire et al. (2013) contend that differentiation and curriculum choice were the most influential of these. The latter falls outside the remit of Westford's practitioner's as educators, differentiation does not, and I consider this additional important driver of teaching behaviours next.

Differentiation

The first National Curriculum of 1992, with its emphasis on accommodating differences in children's abilities, aptitudes, and needs (NCC, 1990) propelled differentiation to a mainstream topic of importance and urgency for all educators. Contemporaneously, “the focus shifted from the problems of the so-called 'lower attainer' to the issues of 'lower attainment' and eventually to the question of raising attainment for all pupils through a differentiated approach to teaching and learning” (Stradling & Saunders, 1993, p. 127). Much like PL, in its idealised form i.e. advanced as a means of appropriately reaching all students, the principle of differentiation meshed with educators’ feelings that “pupils tend to learn in different ways and at different speeds, and that … there will be marked variations in the levels of attainment they achieve and the kinds of learning difficulties and problems they experience” (Stradling & Saunders, 1993, p. 129). Such a stance was reflected in the conceptualisations of Tomlinson (2001) and Schroeder-Davis (2009) in Table 3.2. In the neo-liberal operational environment, differentiation was seen as a crucial teaching strategy in the drive towards raising standards. This performative turn is evident in the alternative conceptualisations of Dickinson and Wright (1993) and Visser (1993).

Table 3.2: Selected conceptualisations of differentiation

Name (Year)	**Definition**
Dickinson and Wright (1993)	An intervention that makes a difference.
Visser (1993)	The process whereby educators meet the need for progress by selecting appropriate teaching methods to match an individual child's learning strategies.
Tomlinson (2001)	A philosophical approach to learner diversity whereby educators plan for and accommodate crucial differences in learners’ readiness, interest, and learning styles.
Schroeder-Davis (2009)	The process of matching learner variables to learning tasks.

Visser (1998) suggests that there are four foci for differentiation - psychological, organisational, curriculum and pedagogical. It is the pedagogical variant that is of concern here. There are two types: differentiation-by-outcome or open-ended differentiation which is the type most recognised and most practiced by educators (Cornwall LEA, 1993; Sebba & Fergusson, 1991). In differentiation by outcome, all students are taught the same curriculum and required to complete the same tasks. Here, the differentiation manifests itself in the different completion times (Leyland, 1996) and/or the quality or quantity of work produced (Berkshire LEA, 1993). The second type of pedagogic differentiation (differentiation-by-input), requires educators to plan and deliver teaching that is matched to meet students' needs, preferences, and differences. This can include any blend of variations in the amount and type of support offered, the resources used, and/or the tasks or activities set for individual or groups of students. Even in streamed ability classes, much less mixed ability groups, pedagogic differentiation is more onerous and challenging in terms of its advance planning load, its classroom delivery, and its evaluation enactment.

Pedagogic differentiation (differentiation-by-input) is a teaching strategy that educators continue to show difficulties with (Keogh & Naylor, 2002; Newman, 2002; Wellington & Ireson, 2012). The Director of the National Education Trust confirms:

> It's not a complex idea, but differentiation is difficult to get right. All educators know that matching their teaching to students' various needs, aptitudes and preferred styles of learning is the key challenge in a classroom. The fact that educators have to do this for 30 students at once makes it even more difficult. You could have an entire teaching career of purposeful practice – more than 10,000 hours – and still not quite crack it (Blatchford, 2015, para. 3).

When educators claim to be differentiating, usually what they are doing is 'micro-differentiation' a retrospective adaptation of the curriculum or teaching that caters for idiosyncratic learners (Tomlinson, 1995). Evidence suggests that educators' theoretical understanding of it is problematic (Gentry, Rizza, & Owen, 2002; VanTassel-Baska & Stambaugh, 2005). The inspection framework at the time of data collection decreed that "Inspectors will not look for a preferred methodology but must identify ways in which teaching and learning can be improved" (Ofsted, 2012a, p. 9). Understandably then, educators struggled to come to terms what was needed during Ofsted inspections. This concludes my discussion on why differentiation was a key model of practice that Westford's practitioners would have been at great pains to enact. I next consolidate the key points of the all the preceding discourse in Chapters 2 and 3 to draw attention to the emergence of knowledge and practice as two reoccurring and overarching themes.

Conclusion

The purpose of this chapter is twofold. Firstly, the discussion paints an indicative picture of the teaching environment as it would have been experienced by

Westford's practitioners at the time of data collection. What I have attempted to show is that the practitioners experienced a working environment which was the product of largely neo-liberal education reform (e.g. Maguire et al., 2013; Whitty, 2002). Devised as technical-rationalist implementers (Bottery & Wright, 2000) functioning at the bottom of the implementation pyramid, their "terrain for action [was] constrained by … dominant policies of standards, attainment, and accountability" (Maguire et al., 2013, p. 333). Unequivocally and inextricably at the heart of the panoply of policies was the "straight line" joining up educator's teaching efficacy to student outcomes (Skourdoumbis and Gale, 2013, p. 892). Simultaneously, educators were "devoid of any freedom to determine local needs and appropriate remediation" (Bottery & Wright, 2000, p. 28) and divested of "pedagogic authority "(Bourdieu & Passeron, 1990, p. 12) (the authority to teach in a certain way so that a particular type of knowledge is conveyed or 'imposed' upon the students ((Jenkins, 2002)), but also considered individually and severally causally responsible for redressing student under-performance.

Crucially, the determination of central government to address the putative educational failing of inadequate academic standards meant that thus, much like the LA, Westford's educators were under considerable and sustained duress to effect teaching practices that improved academic standards. In the relentless quest for improved outcomes virtually no aspect of the teaching process was left untouched (Davies, 2015). As part of the raising standards discourse a cohort of high-profile (Maguire et al., 2013) teaching initiatives and ideas were 'ushered' into schools which together constituted the "centralised pedagogy (or 'one best way')" (Skourdoumbis & Gale, 2013, p. 894) to teach. To be considered a good i.e. effective educator meant acceding to the "pre-determined and tested/modelled 'truth'" (Skourdoumbis & Gale, 2013, p.894) and in practical terms, this meant Westford practitioners embracing and enacting the central policy initiatives, directives and teaching models of practice thus highlighted. What may have united this cohort of teaching initiatives and ideas was their substantial influence on educators' teaching behaviours because they were typically framed as orchestrating labels (Cribb and Owen, 2010), that is to say, hypothetically good ideas, but in practice they had only at the most modest 'specificity'. Specificity according to Maguire et al. (2013) in the context of policy concerns how much "interpretative work" (p. 323) is needed to enact the policy in question. Problematically though, the likely consequence of this all would have been that the practitioners would have found this cohort of teaching initiatives and ideas at the forefront of their practice agenda but their actual enactment highly challenging, if not somewhat impossible.

My examination of the theoretical literature documented in this and the preceding chapter serves as two strands of the conceptual framework of this inquiry. Finally, I make the added observation that although I have not specifically foregrounded them, two naturally reoccurring threads in this discourse are educator knowledge and practice of models of practice. In the next chapter I use the brain-based literature to show empirically that educator knowledge and practice of brain-based education are indeed, the very two issues that this research is concerned with.

Chapter 4: **Conceptual Framework: Empirical Literature: Brain-based Education**

This chapter documents the empirical literature which concerns brain-based education and educator's knowledge and practice of it. Based on the analysis in Chapter 2 and 3, the two major themes I use to structure the ensuing discourse are;

1. "Educator use of brain-based education". This relates to educators' use of brain-based education and its operational devices.
2. "Educator's knowledge of brain-based education". This relates to educators' knowledge of brain-based education and its operational devices.

For clarification, unless otherwise specified, I have retained the terminology adopted by the researchers when they discuss their research samples.

Chapter overview

I first provide an account of and rationale for the search strategy adopted. Thereafter, I consider selected empirical literature from the field of brain-based education. Theme 1 commences with an examination of the research on the use of brain-based education. It proceeds with an examination of the equivalent research on how brain-based education is used and thereafter the research on why brain-based education is used. Theme 2 accounts for the research on educators' knowledge of brain-based education, the research on acquisition of knowledge on brain-based education and finally the research on interventions in brain-based knowledge. Thereafter I position this study firstly within the relevant epistemological and then secondly within the methodological gaps in the brain-based empirical literature. This enables me to devise a series of research questions that can be taken forward to Chapter 5 so that philosophically congruent research methodology and methods can be formulated.

Approach to literature review

In this sub-section I document how I adopted a systematic approach to my search of the empirical literature and thereafter how I adopted a critical and rigorous stance to the analysis and evaluation of the literature thus identified.

Systematic approach

The commencement of the review process always focusses on determining the review protocol (Dickson, Cherry, & Boland, 2014; Fink, 2010; Wardlaw, 2010). This featured a consideration of the focus and parameters of the review, of which the output was the following review question, *What was the impact on the knowledge and practice of secondary practitioners of a brain-based pedagogical component of a professional development programme?* Besides, Oxman (1994) cautions that without a clearly focused review question there is little point in going any further in a review. Equally important at this stage is the determination of the inclusion and exclusion criteria for the search, which is presented in Figure 4.1.

- Only literature in English was included.
- The time frame for the literature was given no lower time limit but its upper end was limited to April 2013 because this is when I commenced my data collection. The coda in Appendix 4.1 brings the empirical literature up-to-date.
- Both grey (unpublished) and white (published) literature was included. (Grey literature is a body of materials that cannot be found easily through conventional channels such as publishers and encompasses government research, non-profit reports, think tank assessments, reports from observations, investigations, and other primary resource materials (Huffine, 2010).
- Only primary research was included.

Figure 4.1: The inclusion and exclusion criteria for the empirical literature search

The most crucial part of the review process concerns the location of the literature (Grayson & Gomersall, 2003) because:

> Unless as much as possible of the relevant literature is identified, all the subsequent effort put into appraisal … risks being wasted. The results will not be truly reflective of the knowledge base and may even be misleading if key material has been missed (p. 3).

Accordingly, the literature location strategy involved searching a selection of key electronic databases as well as the search engine Google using a number of keywords and keyword combinations using the strategy highlighted in Figure 4.2. Manual or hand searching (Fleeman & Dundar, 2014) through electronic tables of content and specific journals targeting the topic was also performed: websites of applicable organisations were also pinpointed and searched. Databases were interrogated included SCOPUS, ERIC, JSTOR, ProQuest, Web of Knowledge, and Google Scholar.

Brain* AND school* OR teach* OR learn* OR educat* OR pedagog* OR Neuroeducat* OR Education* Neuroscienc* OR Neuropedagog*

Figure 4.2: Keyword search strategy

Google Scholar was included alongside the proprietary bibliometric databases because it is considered to be "by far and away the best (most inclusive) of the world's bibliometric systems now because it covers not just journal articles, but also citations of books" (Writing for Research, 2014, para. 11). Since there was an explicit attempt to be exhaustive (Gough, 2007) in terms of locating and documenting all the serious empirical literature, the main Google database which provides the additional advantages of being current and "covering news media, blogposts, and the extensive 'grey literature' from corporate and professional bodies (as well as academic reports and working papers covered with a lag)" (Writing for Research, 2014, para. 13) was also included in the search. This also served to counter the worry posed by possible location bias of the literature found by searching only in indexed bibliographic databases (Fleeman & Dundar, 2014). The search strategy resulted in the location of approximately relevant 550 abstracts. Only about 120 of this cohort provided relevant scholarly comment. It was only these documents that were downloaded and recorded using the EndNote reference manager program. Of this cohort, only 51 were primary research reports.

I then reviewed each of the reports in depth, assessing the strength of their methodological and analytical procedures but equally importantly, examining their conceptual frameworks and literature reviews, especially for any material purporting to be or to explain neuroscience. Gorard (2014) writes that synthesising existing evidence should avoid bundling strong and weak evidence together so that "invalid and possibly dangerously misleading conclusions" (p. 48) are avoided. This part of the process is often called the screening process (Godin, Stapleton, Kirkpatrick, Hanning, & Leatherdale, 2015) or the quality appraisal or evaluation process (Hewitt, 2007) and it is where the quality appraisal criteria are applied to the identified literature corpus. I used the simple threshold advocated by Gorard (2014), that of trustworthiness, rather than the application of a more detailed list of quality criteria:

> 'Strong' and 'weak' here refer not to the size of the difference, pattern, or trend uncovered but to how convincing the evidence for it is…systematic and narrative reviews of existing evidence will be invalid if each study is merely given equal weight … 'Trustworthiness' here is something like how convincing the finding is (Gorard, 2014, p. 48).

A substantial number (32) of the 51 reports deploy brain-based education in their conceptual frameworks. This in itself isn't problematic because indeed, this research itself is focussed upon brain-based education. What was problematic however, was that whilst offering a conceptual framework embedded in brain-based education, they were unable to offer any level of criticality on its position of it with respect to its contested constitution, instead accepting the claims of brain-based education at face value. Furthermore, to compound this absence of scholarliness in terms of balance and accuracy, many of these reports used brain-based sources as the basis for their assertions about the science behind the brain and its function. Additionally, many of these theses also demonstrated weak methodological and/or analytical underpinnings. On this premise, I was unable to assure myself of the trustworthiness of the findings of 32 papers, which were mostly unpublished doctoral theses. These were thereby excluded from the empirical literature cohort for the purposes of this review.

Critical-narrative approach

As I have already indicated, I intended the search to be exhaustive but as Gorard and See (2013) observe "As with any review there will be studies that have been missed, and the findings may be biased if their inclusion would substantially alter the review conclusions." (p. 741). In that I can demonstrate that I searched all the key resources and utilised an appropriate strategy (Fleeman & Dundar, 2014), I am reasonably confident that like See and Gorard (2013) who conducted their own review in a different field, that "The latter seems unlikely as this study is the largest and most up-to- date review on this topic, and it is hard to envisage it missing predominantly the largest or best studies". The 19 empirical studies that survived the screening process described above were used to construct the critical account of where not only the knowledge, but equally importantly, the methodological gaps were in the literature corpus. In this way, the literature review process going forward takes on the attributes of a critical literature review, as described by Wallace and Wray (2006) thus:

> We define a critical literature review as a reviewer's constructively critical account, developing an argument designed to convince a particular audience about what the published – and possibly the unpublished – literature … indicates is and is not known about one or more questions that the reviewer has framed (p. 130).

This section has served to provide the rationale for and operational details of the review methodology employed, paying special attention to the way in which the two overarching principles of criticality and rigour were invoked to ensure the optimum trustworthiness of the review findings. The next section provides a summary of the discourse in the literature as it relates to the empirical underpinnings of brain-based education in the dimensions of educator knowledge and practice.

Empirical Literature: Theme 1: Empirical literature on educators' practice of brain-based education

Earlier, I asserted that a dominant neuroeducational claim is that brain-based education has become widely practised by educators. However, scarce empirical evidence existed to support this assertion (Alekno, 2012). Moreover, there is also limited evidence marshalled in support of why brain-based education is used, and even less still accounting for how it is used. I consider each of these points in turn, beginning with the evidence on educator's use of brain-based teaching strategies/methodologies.

Research on the use of brain-based education

The level of use of brain-based teaching strategies/methodologies by educators is empirically unclear. There are only seven pieces of research that have produced evidence in this regard. Chronologically these are Greenwood (2006), Pickering and Howard-Jones (2007), Whitehead (2011), Alekno (2012), Brevoort (2012), Hook and Farah (2012), and Rato et al. (2013). Of these, only Pickering and Howard-Jones (2007) and Whitehead (2011) ask about the use of brain-based education and/or its operational devices. Since Whitehead's (2011) research reports on an unnamed brain-based methodology which was used as a school improvement tool, I deal with his findings in the later section on research on interventions in knowledge. Alekno (2012) and Rato et al. (2013) asked about the 'use' of neuromyths. As earlier explained, studies such as these have framed neuromyths broadly to include neuroscience knowledge and/or its commensurate operational device i.e. in my terminology, neuromyths+. Greenwood (2006), Brevoort (2012) and Hook and Farah (2012) all asked educators about their use of neuroscience/neuroeducation. They received answers that included the use of operational devices of brain-based education (as well as teaching strategies that where wholly unconnected with either neuroscience/neuroeducation or brain-based education). Temporally, the only study concurrent with my own data collection was that of Rato et al. (2013). For this reason, I consider the data of Rato et al. (2013) to represent contemporaneous findings of use, and the remainder of the studies to represent historic findings of use. After exploring each study individually next I synthesise all the collected findings to venture an overall assessment of usage per operational device to cover the contemporaneous and historic timeframes.

Using a mixed methods approach, Pickering and Howard-Jones (2007) studied the views of educators who typically had already expressed an interest in neuroeducation and brain-science. 189 UK and international educators were surveyed, and this was followed by 11 interviews with UK educators. 108 of a sub-set of 150 respondents who had attended UK neuroeducational conferences called "questionnaire participants" (p. 111) had heard about and claimed to have used a range of brain-based "initiatives" (p. 111). Somewhat problematically though, Pickering and Howard-Jones reported use on an institutional rather than personal basis. They reported that of the 108 who answered, 24 confirmed institutional use of Brain Gym®. The equivalents were 24 for collectively VAK theory, Multiple Intelligence theory, Brain Laterality and Whole Brain Learning, and 42 collectively for Mind Mapping, Brain-based Learning and Accelerated Learning.

Alekno (2012) used a mixed methods study to investigate beliefs and self-reported practice of neuromyths+ for 161 teachers drawn from across the phase range in a US school district. She found that 78 per cent of teachers said they used Multiple Intelligence theory: the equivalent figures were 74 per cent for the 10 per cent Myth, 68 per cent for VAK theory, 56 per cent for Enriched Environments, 41 per cent for Brain Laterality and 10 per cent for Brain Gym®. Limited interviews afterwards (n=4) led her to conclude that the classroom practice of the operational devices was "messy and inconsistent" (p. 165). Rato et al. (2013) collected data using an online survey (n=625 original, n=583 final) to ascertain the level of belief in and use of neuromyths with Portuguese teachers (across all phases and geographically dispersed across Portugal). They found that 71 per cent of the teachers did not report adopting "techniques based on ideas concerning the brain" (p. 447) and a further 11 per cent "ignored the existence of these techniques" (p. 447). Of the 18 per cent (n=103) that did report use, 34 per cent of these did not provide any examples of use. 19 per cent said they used memory strategies, 16 per cent claimed to use Multiple Intelligence theory, and 4 per cent claimed to use "multisensory exercises" (p. 447). Rato et al. (2013) and Alekno (2012) both found no correlation between teacher characteristics (e.g. age, gender, experience, age of students taught, and highest qualification) and the use of brain-based operational devices.

Greenwood's 2006 exploratory study of 90 Canadian educators (all schooling phases) who were already active consumers of PD and keen to improve their professional practice revealed that a minority (40 per cent) used brain-based teaching strategies/ methodologies presuming them to be neuroeducational. Participants explained that they commonly practised Mind Mapping, Multiple Intelligence theory, learning styles and the Mozart Effect. Confusingly, and symptomatic of the lack of clarity displayed even by academics over terminology and science, Greenwood (2006) used the term brain-based to mean neuroscience and cognitive psychology. Greenwood's (2006) classroom observations coupled with the survey results lead him to conclude that educators were:

> attempting to use what they think are [neuroscience and cognitive psychology] but these strategies do not have their origins in recent findings from [neuroscience and cognitive psychology] research. The strategies may be based in sound pedagogy, but they do not originate in the research referred to as [neuroscience and cognitive psychology]. The strategies mentioned and demonstrated have been used for a number of years; what appears to be happening … is that educators are learning about [neuroscience and cognitive psychology] research and then justifying their techniques they are already using by making connections between what they are doing and what they understand as [neuroscience and cognitive psychology] research (p. 153).

Brevoort (2012) employed a mixed method approach in her exploratory study of US middle and elementary school educators' experiences of PD focused on presumed neuroscience, their application of this knowledge and their receptiveness to further neuroscientific PD. 93 responses were received to the online survey part of the study: this was followed by five structured interviews. 58 per cent of her participants said that they used brain-based operational devices often believing them to be neuroeducational strategies. Of the strategies used, 35 per cent reported using the Mozart Effect, 92 per cent used VAK theory and 62 per cent employed some aspects of the Brain Gym® approach.

Hook and Farah (2012) undertook a qualitative study based in the US with a group of repeat attendees of brain and learning conferences (n=13). Their primary research aim was to identify what educators were looking for from neuroscience, and what, if anything, they had found of use. VAK theory and Enriched Environment were cited as the operational devices used – again these were presumed by their educators to be neuroeducational strategies.

Table 4.1: Summary of empirical findings on the use of individual operational devices

Brain-based operational device	**Self-reported use (per cent)**	**Self-reported use (used or not)**	**Assessment of level of historic usage**
VAK theory	68[1] 92[4] (multisensory variant, see later)	Used [2 3]	High level of usage
Mind Mapping		Used[2 3]	Level of use unclear
Accelerated Learning			No evidence
Mozart Effect	35[4]	Used[2]	Level of use unclear
Enriched Environment	56[1]	Used[3]	Level of use unclear
Multiple Intelligence theory	78[1] 3 [5] *	Used[2]	Historic and contemporaneous* level of use unclear
Brain Gym®	10[1] 62[4]		Level of use unclear
Brain Laterality	41[1]		Level of use unclear
Whole Brain Learning			No evidence
10 per cent Myth	74[1]		Level of use unclear

[Key: 1= Alekno (2012), 2= Greenwood (2006), 3=Hook and Farah (2012) 4=Brevoort (2012), 5= Rato et al. (2013) *]

To establish the relative use of the individual brain-based operational devices across the six studies I have assembled the available evidence in Table 4.1. I have omitted Pickering and Howard-Jones (2007) because they assess institutional use rather than personal use. There is no consistency of usage reporting across the remaining five studies. Some studies opt for quantification in terms of mentions, others give percentages, and some indicate use on a binary scale i.e. used or not used. Alekno's

(2012) assessment that the use of the operational devices of brain-based education is messy and inconsistent appears to be supported by the analysis in Table 4.1. There is only one operational device that has a finding for contemporaneous usage. This is Multiple Intelligence theory where Rato et al (2013) found that only 3 per cent of their sample claimed to use it. More research is clearly needed to supplement the extant limited evidence. This is also certainly true of the rest of the operational devices where there is no evidence at all for the contemporaneous usage.

The rest of the findings across the four studies concern historic use only. Except for VAK theory, where all four reporting studies seem to find for at least some good degree of use, all other operational devices present problematic usage finding profiles. For example, Brain Gym® has an evidence profile that shows significant divergence across the two reporting studies. This means that coming to a reliable overall assessment of its historic use is difficult. Establishing what the general historic use of other operational devices like Accelerated Learning and Whole Brain Learning was has also been impossible because there is no evidence at all to consider. Moreover, for these two operational devices and all the others that have limited numbers of evidence points, managing the issue of participant non-reporting has been problematic. Where studies adopted an open-ended data gathering method, participant silence on the use of operational devices can perhaps be taken as a signal of no use. However, the results of the studies of Brevoort (2012) and Alekno (2012), who both used a deductive approach (i.e. predetermined questions), are perhaps more problematic. Because they did not ask their participants about all the operational devices that are the focus of this study, silence cannot be taken as proxy for no use. Clearly more research needs to be undertaken for all the operational devices to produce more reliable assessments of:

1. their use or not, both historically and at the time of data collection and,
2. if they were/are used the extent of use.

I now explore the empirical evidence on how brain-based education is practised.

Research on how brain-based education is used

Four studies sought to examine how the operational devices of brain-based were used, these being Greenwood (2006), Alekno (2012), Breevort (2012) and Hook and Farah (2012). Greenwood asked directly about how the presumed neuroscience-informed models of practice were used. Problematically though, he presented the findings without any attempt to match individual strategies to their claimed modality of implementation. Furthermore, the respondent answers were ambiguous. They served to confirm his earlier analysis that the respondents had a very expanded and vague opinion of presumed neuroscience informed models of practice i.e. operational devices of brain-based education. Although Hook and Farah (2012) didn't ask the specific question about how the presumed neuroscience informed teaching strategies were used, their educators did say said that knowledge of (purported) brain function had changed their practice. Hook & Farah (2012) asserted that it was hard to isolate the manifestation of the change in teaching practice since many of the answers were vague. They found that participants encountered great difficulty in articulating what these practices were and struggled to explain how they were employed.

Alekno (2012) asked her five interviewees about how they used the most popular neuromyths+ (Whole Brain Learning, Multiple Intelligence theory, the 10 per cent Myth, Enriched Environments and VAK theory). She found that VAK theory, Multiple Intelligence theory, the 10 per cent Myth and Enriched Environments were used to effect engagement and differentiation. The teachers focused in on the perceived utility of these operational devices to allow them to understand and respond to student diversity and the concomitant diversity of learning needs, thus offering more equitable learning experiences to the students. Alekno (2012) concluded that the teachers felt that they needed multiple teaching strategies at their disposal in the classroom. They saw this small group of operational devices as diversifying their trusted teaching toolkit. She concluded that the other operational devices were not practiced because they were not perceived to have utility in terms of differentiation and engagement. Before concluding this section, I highlight the interesting case of VAK theory. It was cited as being used in four studies (see Table 4.1). In Brevoort (2012) however, the respondents were surveyed about the multisensory variant of VAK theory, rather than the ordinal version. Accordingly, I have called this variant of VAK theory multisensory VAK theory. This was the VAK variant mostly espoused by TEEP and that recognised by Geake (2008).

In conclusion, what appears to have been largely overlooked by many studies is how the brain-based teaching strategies/methodologies were being used. Of the few that did seek to examine the detail of how usage occurred, the findings did not indicate a clear picture at the level of individual operational devices. In sum, more research needs to be undertaken to produce more reliable assessments of how they are used.

Research on why brain-based education is used

This section explores the empirical literature in the context of the reasons attributed to the use of and attraction to brain-based education. In common with the two preceding sections, there is only a very limited evidence base. The evidence base consists of Pickering and Howard-Jones (2007), Whitehead (2011), Alekno (2012), Greenwood (2006) and Hook and Farah (2012). Of these studies, the last one was framed within a neuroeducational paradigm.

Greenwood (2006) found that educators were "looking for a better way to teach … and … be better practitioners" (p. 80). Brain-based education was thought to confer commercial advantages in a competitive market (Whitehead, 2011). Whitehead writes that after the whole-school implementation of a new (but unnamed) brain-based methodology, the school actively marketed itself using its new neuro-teaching approach. The headteacher felt that the brain-based label could assist the school in effecting a marketable advantage in an otherwise challenging and competitive educational marketplace, concluding that it would demonstrate that the school was both at the cutting edge and different. Pickering and Howard-Jones (2007) found that collectively, Brain Gym®, VAK theory, Multiple Intelligence theory, Brain Laterality and Whole Brain Learning, Mind Mapping, and Accelerated Learning were rated as being "very useful" (p. 111) by a notable number of their respondents. Pickering & Howard -Jones (2007) said that the respondent interview responses provided them with a keen sense that they:

> were often presented by individuals who had given considerable thought to the needs of the educators, were able to provide teachers with something that they could use in class straightaway and had developed their dissemination style to be memorable and appear meaningful (p. 112).

Only the interview part of Alekno's (2012) mixed methods study collected data about the reasons why the most popular neuromyths+ were used. Of these five top neuromyths, only Brain Laterality, the 10 per cent myth, VAK theory and Multiple Intelligence theory coincided with the operational devices under scrutiny in this research. Her five interviewees cited multiple reasons for using and being attracted to these brain-based teaching strategies. Alekno (2012) did not present her findings by operational device. All her interviewees indicated that collectively these neuromyths were:

> tools or concepts that allow them to better understand students' needs, interests, and variability. All interviewees had observed differences in how their students learn and had observed variability in students' learning strengths and weaknesses. All interview participants also acknowledged that coping with the wide spectrum of learning variability in the classroom can be very difficult (2012, p. 146).

Neuromyths+ were perceived to be both a way of diagnosing these learning differences and a way to solve them. Alekno (2012) observed that the interviewees expressed a powerful desire to provide a level playing field for all their students and neuromyths+ were thought to be a tool that allowed this goal to be achieved. Moreover, preparation of students for the world outside school was another significant aim of teachers. Neuromyths+ facilitated this in the minds of the interviewees because they enabled students to learn from new perspectives and supported the making of connections to real world experiences. Additionally, there was a strong feeling that neuromyths+ improved student learning and engagement outcomes. She concluded that:

> Even though the interview participants recognized the utility of the five neuromyths for diversifying instructional strategies for student learning variation, none of the participants viewed these approaches as a panacea for educational problems. Interview participants simply viewed these neuromyths as an opportunity to expand their teaching strategies and to respond better to student learning differences. The five neuromyths were one part of a tool-kit (Alekno, 2012, p. 151).

Replicating Alekno's (2012) findings, there was not just one reason offered by Hook and Farah's educators for their attraction to what they believed to be neuroeducational teaching approaches (but which were either brain-based, derived from educational psychology or just standard teaching strategies). One reason was that the presumed neuroscience informed teaching strategies were perceived to be interesting and exciting and using them made the educators feel more enthused about being a teacher. Like Alekno's (2012) participants, Hook and Farah's educators expressed a need to find ways to understand their student's learning needs and challenging behaviours. These presumed neuroscience informed teaching strategies were considered to be up-to-date ways that could help fulfil this goal. Their educators felt that the use of these teaching strategies enhanced their professional image and provided a mechanism for confirming their existing practice and justification of their methods to others.

My own experience in secondary education would suggest that there are more unexplored factors that can account for the use of and attraction to brain-based education. Earlier I suggested that a non-exhaustive list of these could include a desire to improve learning outcomes for students and a desire to be perceived as an innovator. They could be perceived as a route to promotion and advancement within/without a competitive school environment and/or be considered to be a mechanism to improve or rescue teaching efficacy. Again, more research needs to be undertaken to better establish the reasons behind the use of brain-based education and its operational devices. For the same reason, more research is needed to better establish the reasons behind the attraction of brain-based education and its operational devices.

In sum, in this sub-section I have focused on the empirical literature that concerns brain-based education and its operational devices in terms of use in the dimensions of how much, how exactly and why. In the next sub-section, my focus is on practitioners, specifically their knowledge as it relates to brain-based education and its operational devices.

Empirical Literature: Theme 2: Empirical literature on educators' knowledge of brain-based education

Educators' perceived lack of knowledge about the brain and its function is at the core of much of the neuroeducational discourse. Consequently, this features as a dominant theme in much of the limited empirical evidence. Suffice to say that the findings of the literature that directly examines the neuroscientific knowledge of educators (Alekno, 2012; Brevoort, 2012; Greenwood, 2006) are in accordance with the a priori suppositions, namely that educators' neuroscientific knowledge is poor. As I have previously contended, there are some epistemological limitations with the remainder of this research. One of these is that it captures neuroscientific knowledge in the context of beliefs rather than knowledge per se. A second limitation is that it substitutes an awareness of the operational devices for a measure of the marketing or commercialisation potency of brain-based education. Cognisant of these caveats, my aim in this section is to critically examine the empirical literature to reach an assessment about educators' knowledge of brain-based education and its operational devices.

Research on educators' knowledge of brain-based education

There is extremely limited empirical literature that has exclusively focused on investigating educators' knowledge of brain-based education and its operational devices. As earlier, Pickering and Howard-Jones (2007) found that 72 per cent of their self-selected respondents had already heard about range of brain-based "initiatives" (p. 111).

These educators could be described as neurophiles, i.e. those with an appetite for neuroscience (Smeyers, 2016; Trout, 2008). The data of Pickering and Howard-Jones did not lend itself to an exact quantification of the levels of the awareness per operational device, because the findings were reported collectively in bundles, for example, "teaching and learning approaches (which included Mind Mapping, Accelerated Learning, and Brain-Based Learning) (Pickering & Howard-Jones, 2007, p. 111). Brain Gym®/Educational Kinesiology obtained 48 mentions. Collectively, VAK theory, Multiple Intelligence theory, Brain Laterality and Whole Brain Learning received 45 mentions. Under the classification 'Teaching and learning approaches', Mind Mapping, Brain-based Learning, and Accelerated Learning jointly received 64 mentions. The research of Dekker at al. (2012) compared the prevalence of neuromyths amongst teachers in England with their Dutch counterparts. They also asked the respondents about whether they had "encountered educational approaches that claimed to be brain-based in their school (Brain Gym®, Learning styles, Multiple Intelligences, Left/right brain learners)" (p. 3). They found that the most encountered brain-based operational devices for both nationalities were VAK theory, Multiple Intelligence theory and Brain Laterality. More English teachers said that they had encountered each operational device. These were for VAK theory 98 per cent, 82 per cent for Brain Gym®, 71 per cent for Multiple Intelligence theory and 44 per cent for Brain Laterality. Her team concluded that this was confirmation of the claim of Howard-Jones et al. (2009) that this was caused by more sophisticated and intensive marketing of brain-based education into UK schools.

The rest of the relevant literature concerns educators' knowledge of brain-based education within the construct of neuromyths/neuromyths+. The research landscape on educators' knowledge of neuromyths as they are conceived of as only contested knowledge is also sparsely populated with limited credible and critical empirical studies available. As already asserted, much of the research into neuromyths is problematic because there is a tendency to equate simplistic assessments of neuroscientific knowledge to beliefs in neuromyths. Often, these beliefs are then also used to infer exposure to the associated operational device (e.g. Tardif et al., 2015). From here, neuromyths often then become proxies for levels of use (e.g. Goswami, 2004). Consequently, that there is a prevalent use of brain-based education thus has become an accepted and pervasive truth amongst neuroeducationalists. Indeed, it may be that it is such epistemological transgressions that compel fellow critical reviewers of the neuroeducational literature to assert that there is a mythology about what educators believe in and do (Alekno, 2012). The typical data collection instrument used in most of this neuromyth orientated research is a survey that has a series of statements about the brain, brain function and various aspects of the neuroscience that underpin the main neuromyths. These statements are typically presented as a balanced mixture of correct and incorrect neuroscience assertions that the respondent must agree or disagree with. Howard-Jones et al. (2009) is a good exemplification of this approach and their data collection instrument has been adopted by many other researchers who are interested in finding out about beliefs in (and practice of) neuromyths.

Howard-Jones et al. (2009) concluded that the trainee secondary teachers attending an Initial Teacher Training (ITT) university course surveyed (n=158) possessed significant neuromyths. Howard-Jones et al. found that the trainee teachers had a level neuroscience literacy that was consistent with their graduate status i.e. better than the public but worse than that of neuroscientists. They also found that many trainees were unable to recognise the incorrectness (or recognise the correctness) of the simplistic neuroscience assertions put forward for the selection of neuromyths included. The level of misunderstanding of the neuroscience assertions for Brain Gym® was 58 per cent. The equivalent figures for VAK theory was 83 per cent and for Multiple Intelligence theory, 56 per cent. These levels were quoted as constituting levels of belief in these neuromyths. The researchers also concluded that these misconceptions could only have been acquired through school-based contact since they asserted that there had been no ITT instruction provided. They claimed that this was evidence of the extensive penetration of the "major brain-based educational approaches" (Howard-Jones et al., 2009, p. 17) of Brain Gym®, VAK theory and Multiple Intelligence theory into UK schools.

The next two studies cited used the data collection instrument of Howard-Jones et al. (2009). Rato et al. (2013) found that VAK theory, Multiple Intelligence theory and Brain Laterality were the most popular neuromyths in attracting 'belief' rates of 63 per cent, 55 per cent, and 35 per cent amongst the Portuguese teachers surveyed. Dekker et al. (2012) found that more than 80 per cent of both nationalities 'believed' in the VAK, Brain Gym® and Brain Laterality neuromyths. The level of belief in the neuromyth of Enriched Environments was 76 per cent and that for the 10 per cent myth was 47 per cent. Alekno (2012) was the only researcher to specifically ask the participants questions about their beliefs in neuromyths+. In her survey, she found that the four most believed neuromyths+ in order were VAK theory (94 per cent belief), the 10 per cent myth (89 per cent belief), Brain Laterality (78 per cent belief) and Multiple Intelligence Theory (72 per cent belief). Separately, in the interview part of her research, she found that "Participants agreed that their understanding of the neural basis for the five most popular neuromyths was limited" (Alekno, 2012, p. 153). I have taken the following view about how the findings of Alekno (2012), Rato et al. (2013), Dekker at al. (2012), and Howard-Jones et al. (2009) about neuromyths/neuromyths+ can support this inquiry. Rather than interpreting these findings as beliefs they can be taken as very crude proxies for two other constructs. Firstly, they can act as a makeshift proxy (when inverted) for the participants' neuroscience knowledge underpinning each operational device. Secondly, they also can be taken as an improvised proxy for what level of awareness there was for each operational device and thus supplement the results of Pickering and Howard-Jones (2007) and Dekker et al. (2012) on this front.

In sum, for the level of awareness of the operational devices, the existing findings qualitatively are that VAK theory, Brain Gym®, Multiple Intelligence theory and Mind Mapping are the most well-known. The consensus for the level of knowledge about the operational devices is that most believed in neuromyth/neuromyth+ was VAK theory by far (it received the highest levels of incorrect answers about its underpinning neuroscience) thereby making it the operational device that was the best understood in terms of its brain-based knowledge. The next best well understood operational device was Multiple Intelligence theory. Before concluding this section, one interesting feature was apparent across multiple studies where open-ended questions were asked (e.g. Alekno, 2012; Brevoort, 2012; Greenwood, 2006; Hook & Farah, 2012; Rato et al., 2013; Whitehead, 2011), regardless of the construct asked about (e.g. neuroscience, neuroeducation, neuromyths/neuromyths+, or brain-based education and its operational devices). I have already foregrounded this finding but include it at this juncture because it speaks more to knowledge than practice. The common finding was that almost without exception, educators had great difficulty in articulating their explanations or descriptions of whatever it was they were being asked about. Alekno (2012) found that her small group of interviewees' understandings amounted to "confusing hodgepodge of ideas" (p. 151) because they "confused the neuromyths with one another and had difficulty describing how the five neuromyths might be integrated into a whole picture" (p. 152). In addition to giving muddled and contradictory answers, answers typically offered blurred the disciplines of neuroscience and psychology, an approach which Hook and Farah (2012) considered to be reasonable, "On the one hand, this can be viewed as confusion on the part of the educators; on the other hand, it can be viewed as a reasonable grouping together of sciences that address the nature of learning and memory" (p. 336). That being said, what is clear since this literature review was unable to locate even one inquiry that was wholly and explicitly focused on what knowledge of brain-based education and its operational devices was possessed by educators, is that more research in this area is needed.

Research on acquisition of knowledge on brain-based education

Alekno's (2012) participants said that they were exposed to neuromyths+ (i.e. brain-based operational devices) through PD, practitioner books, but especially through discussion with other teachers. Pickering & Howard-Jones (2007) found that educators attending a conference about neuroeducation named conferences, books, and PD as the three key sources of information for what they believed to be neuroscientific knowledge. Greenwood (2006) found that 89 per cent of his educators obtained their purported neuroscience knowledge predominantly from PD. Brevoort (2012) found that there were differences in the other main ways that her educators learnt about purported neuroeducation. The clear majority obtained putative neuroscience information independently through reading, but about half her educators said that they watch TV or go online. She also noted that most educators said that during PD events they had been informed that certain teaching strategies were based on neuroscience but that they were never given the actual research to read. Rato et al. (2013) noted that the main sources of information about purported neuroscience for their Portuguese teachers were the TV and the Internet. Dekker et al. (2012) found that the more science reading her teachers did, the better their general knowledge but that the more likely they were to believe in neuromyths.

There seems to be a consensus amongst those minority of studies that have focused on brain-based education (rather than presumed neuroeducation) that PD is the main mechanism for acquiring knowledge of brain-based education and its operational devices. Nevertheless, my own experience suggests that there are additional, important sources of information about brain-based education and its operational devices that have yet to be documented. As I have argued in Chapter 3, Ofsted, SNS and other cultural players are involved in the transmission of many educational initiatives and ideas. However, there is no mention of these sources in any of the research that is set in England. On this premise, more research is needed to establish a more comprehensive position on the sources of knowledge for brain-based education and its operational devices.

Educators were generally keen to learn more about the brain (Breevort, 2012; Pickering & Howard-Jones, 2007; Rato et al. 2011 & 2013) and several studies coalesced around the common finding that most teachers recognised and indeed were enthusiastic about the potential of neuroscience to inform education (Hook & Farah, 2012; Pickering & Howard-Jones, 2007; Rato et al., 2011 & 2013; Serpati & Loughan, 2012). Pickering & Howard-Jones (2007) also found that many educators were keen to be active partners in the development of the field of neuroeducation. Alekno (2012) was the only researcher to find that her educators were not interested in learning about the brain – they were more focused on students' interests and behaviours. Greenwood's (2006) educators were interested in principle but cited lack of time as being an inhibitor.

Research on interventions in brain-based knowledge

Only one study has produced findings about the effects on a brain-based education intervention into the effects on knowledge and practice of educators. Whitehead's (2011) study is especially informative because it goes beyond the study of outcomes to examine the process of implementation of a brain-based methodology. Using a qualitative methodology, Whitehead researched the implementation of an unspecified brain-based methodology in a private boy's school in New Zealand. Whitehead's methods included documentary analysis, observations, and interviews. Whitehead found that the brain-based education consultant had framed the PD to convey the implicit message that the prior teaching of the staff had disadvantaged the boys. He reported that the school's senior leaders uncritically accepted the selective and popular interpretations of both primary neuroscience and putative neuroscience. Whilst some staff fully accepted the claims of the consultant, there was an extremely limited impact on practice. Some teachers implemented some more generic advice rather than the specific brain-based teaching strategies/methodologies mainly to assuage the school leadership. These teachers used a discourse of cognition to moderate the implementation of the operational devices. Senior staff however, believed that anything with a brain-based education moniker had an "unassailable empirical legitimacy" (p. 79).

Although it is not based in the same national context, of all the evidence presented thus far in this section, Whitehead's qualitative inquiry is the closest to replicating the operational environment of Westford's practitioners i.e. characterised by notions of performativity, managerialism and marketisation. Furthermore, like my own inquiry, it is a qualitative investigation of a naturally occurring large-scale intervention into brain-based education PD that was carried out to improve student academic outcomes. Consequently, the findings of Whitehead are particularly relevant, compelling and appealing.

To summarise, this section has reviewed the research on the use of brain-based education by educators, and educators' knowledge of brain-based education and its operational devices. In the next section I further develop the knowledge and methodological gaps in the empirical literature thus discovered with a view to constructing the research questions for this inquiry.

Positioning this inquiry within the gaps in the empirical literature

Knowledge gaps

Whilst undertaking the review of the literature an approach has been adopted whereby at the end of each sub-section the case is briefly summed up to identify the need for further research to be undertaken in the associated area. The aim of this section is to assemble the main knowledge gaps thus identified so that the research questions can be appropriately formulated.

Apart from VAK theory, there were problems with all the other operational devices in respect of their findings about historic usage. There was insufficient evidence to assess contemporaneous levels of use of any operational devices. Consequently, the only operational device whose historic level of use can be established with any degree of certainty was VAK theory. Here, all reporting studies seem to find for at least some good degree of use amongst educators. The high historic level of use of VAK theory extends to educators both here in the UK and further afield and that it crosses roles and responsibilities, teaching phase boundaries, and experience levels. There is also some evidence to suggest this level of use included a variant of VAK theory, a multisensory approach to the provision of teaching materials. Limited evidence suggests that VAK theory, Multiple Intelligence theory, the 10 per cent Myth and Enriched Environments were used to effect engagement, differentiation and diagnosing student learning needs. There is evidence to suggest that educators struggled with articulating how they used the operational devices they claimed to use. On this premise, two questions that this inquiry needs to ask is firstly what brain-based teaching strategies/methodologies, if any, are used by secondary school practitioners and has this practice changed over time and secondly, how are brain-based teaching strategies/ methodologies used by secondary school practitioners.

Whilst it was clear that brain-based education was found to be generically useful by those who claimed to use it, there was no one dominant reason evident across the limited range of evidence available reviewed in this regard. The list included giving a comparative advantage (to schools), improving student learning and engagement, making the classroom environment equitable for all their students and preparation of students for the outside world. As well as reasons that related to situations where students were felt to be the main beneficiaries, educators proffered a set of reasons where they felt they personally benefitted from using brain-based education. These included making them feel excited about teaching again, enhancing their professional image, and a means to justifying and confirming existing teaching practices. Curiosity, finding brain-based teaching techniques interesting and exciting and a desire to be using up to date teaching methods, were reasons cited for being attracted to brain-based education. Although it is somewhat tangential to the research aims of this study, there was perhaps a reliable body of evidence to suggest that neuromyths as beliefs are widely dispersed among educators. Additionally, there was convergence that VAK theory, Multiple Intelligence theory, Brain Laterality, Brain Gym® and the 10 per cent Myth are the most popularly held neuromyths (as beliefs). Of these, VAK theory was by far the most widely held neuromyth. On this basis, one question that I want to ask is why do or do not educators use brain-based teaching strategies/methodologies.

Like the evidence on the practice of brain-based education, there was limited empirical literature on the educator's knowledge of brain-based education. Of these findings, there was some consensus that there was at least a good level of awareness of most of the operational devices. Of these, VAK theory was the operational device that was the most well-known. Again, somewhat tangentially to the purposes of this study, the consensus of the literature that exclusively examined the neuroscientific knowledge of educators found that it was poor, i.e. somewhat worse than could be expected for the typical graduate (i.e. without out qualifications in neuroscience). The most popular mode of acquisition of knowledge on brain-based education (and neuroscience and educational neuroscience) appears to converge on PD. Other less frequently mentioned sources included conferences, books, the internet and TV. There is only one study that examined the effects of a PD intervention in brain-based education (Whitehead, 2011). Its findings were that the PD had an almost negligible effect of the practice of brain-based education by the teachers involved. Based on this epistemological gap, two further questions for this inquiry are firstly, what understanding do secondary school practitioners have of brain-based education and its teaching strategies/methodologies; and secondly, was TEEP PD the only or main source of this knowledge?

As previously noted, one major issue that emerged within the evidence base examined was its proclivity to conflate beliefs and knowledge. This problem was compounded by the further conflation whereby the knowledge/belief and its commensurate operationalised brain-based education device were taken to be one and the same. The result of these melding of key constructs was a lack of clarity about the actual prevalence of each. The main implication of this was that the task of trying to isolate the findings under each of the sub-headings about only the operational devices became very difficult. This may well have been largest epistemological problem encountered in compiling this critical review of the evidence, but by the same token there were substantial epistemological gaps present in the literature.

In summary, on the matter of the practice of brain-based education, the studies only appeared to be asking participants to report on contemporaneous use of brain-based teaching strategies and methodologies. There appeared to be no studies that reported on whether the usage profile changed over time, and moreover, if it had changed, what were the reasons for any change. Also, there was a relative absence of research establishing how educators employed the brain-based teaching strategies/methodologies they reported using. Finally, although there was an attempt made at understanding the reasons for the adoption of the operational devices, I concluded that there were further additional, yet unexplored factors, contributing to the use of brain-based teaching strategies/ methodologies. To sum up, what has been highlighted is the need to acquire a better understanding of the mechanisms involved in the adoption of brain-based education's operational devices by educators. This gap can be addressed by constructing research questions that prioritise asking how and why?

To conclude, in terms of knowledge the main gaps in the literature appeared to be based on the following two issues. Firstly, it did not appear that any researchers explicitly asked educators what understanding they have of brain-based education. Secondly, there was also a relative absence of any empirical findings relating to the knowledge that educators possessed about the operational devices of brain-based education, other than that acquired in terms of the conflated construct of contested knowledge/beliefs. These gaps privilege research questions that ask, in the context of knowledge, what?

This sub-section has foregrounded the gaps and uncertainties in the knowledge base as they appear to exist in terms of educator knowledge and practice in regard of brain-based education. I next document the equivalent gaps and uncertainties that are of a methodological nature.

Methodological Gaps

In the earlier discussion, I concentrated on the knowledge gaps in the evidence corpus but equally in the interests of comprehensiveness and balance, when framing the research questions what remains important is a consideration of the methodological gaps.

Building on this assessment, I now revisit and summarise my earlier methodological in-situ critiques of the empirical evidence in the context of educators' use of brain-based education. Firstly, that most of the research studies cited above rely on the participants to self–report their use is cause for concern on the grounds of what *is said is* done may not necessarily reflect what *is* done. My experience working with educators leads me to conclude that this worry can only quashed by a research design that incorporates the use of observational data collection methods to avoid legitimate questions about validity. Secondly, only a very limited number of studies mobilise the triangulation of reported data through observations or indeed documentary scrutiny. Indeed, there are other important homogeneity issues relating to geographical location and age/phase range which also need to be considered. There is limited consistency regarding the population sampled across these studies. For example, Dekker et al. (2012) researched teachers whereas Hook and Farah's (2012) participants spanned a wider range including not only teachers but others concerned with the educational experience of children. Compounding the issue, many studies citing previous work conflate the two. As an example, many of those who quote Pickering and Howard-Jones's (2007) research forget crucially that it applies to educators rather than teachers and these two groups do not necessarily share the same characteristics.

I have two further but imbricated worries about the implications of the array of diverse types of research samples evident across the empirical studies interrogated here. One concerns the claims, both implicit and explicit, levelled about to the parent population of educators and the second one involves the appropriateness of the various statistical analyses undertaken to generate such claims. Firstly, many studies present a sample from a special sub-population of teachers/educators/practitioners that demonstrate characteristics not representative of the parent population. Hook and Farah noted that the inclusion of repeat attendees of professional training biased their sample toward educators who were both interested in neuroeducation and valued it. They argued however that this was an asset. As such they were advocating for selection bias, in that their research was directed at exploring the nature of the attraction to neuroeducation and thus a fully randomised approach was unwarranted. Not all authors are as candid as this leaving tangible uncertainty about the extent of the real generalisability of their findings. For example, the analysis of Rato et al. (2013) of their participant demographic characteristics led them to conclude that there was good generalisability to the parent population of all Portuguese teachers. Secure generalisability however can only be achieved when the sample is randomly selected and without more details, that this transpired in this study cannot be established with enough certainty to dispel the initial concerns in this regard.

Lastly, the major portion of the literature reveals a preponderance of either quantitative or mixed method approaches that are predisposed to studying outcomes at the expense of processes. Additionally, the dominance of such methods arguably results in 'thin' data where the quantitative aspects are emphasised at the expense of rich qualitative insights. On balance, quantitative or mixed method approaches are thus perhaps not ideal for studies such as this that are seeking to redress the balance by prioritising processes and mechanisms.

In this section I have considered the methodological gaps in the empirical literature. In the next section, I draw together these, and the previously established knowledge gaps, as a prelude to establishing the research questions.

Research Questions

I have suggested in the previous sub-section that the main epistemological gap is the propensity of research to focus on the outcomes rather than the process regarding the adoption of brain-based education by educators. Furthermore, I suggested that this should be addressed by constructing research questions that have a focus on asking how and why. The main methodological gap identified above relates to the propensity of the research to adopt a mixed methods or quantitative approach with methods that rely on the self-reporting of participants. The implication is that a qualitative approach with multiple methods to enable triangulation is warranted and moreover one method should be observationally based (of the participants' teaching). I have reserved the substantive discussion on methods and methodology for Chapter 5 and 6 respectively. Equally, even though the matter of sampling is dealt with in Chapter 5, the issue of lack of sample homogeneity across the studies and its conflation in the literature reviews of others reminds me to 'frame and name' my sample population/participants with care – and this is relevant here at the point where the research questions are constructed. Accordingly, my research questions frame my participants as 'practitioners' and I delineate these as in Figure 4.3.

I frame practitioners to comprise two groups of educators. The first group are practicing expert and influential secondary school teachers working in Westford LA. The second group comprise secondary school-facing Westford LA SIO personnel that have the same characteristics.

Figure 4.3: Working definition of practitioners for this study

The epistemological gaps highlighted above in our understanding of brain-based education ostensibly and primarily equate to practice and knowledge issues. On the former, I have set out the considerable gaps in our understanding of the usage of brain-based education in the dimensions of what, how and why. On the latter, I have shown that there is uncertainty over the exact nature of the knowledge of brain-based education and its teaching strategies and methodologies amongst educators. Accordingly, in the research context already outlined, the central research question in this thesis asks: *What was the impact of a brain-based education component of a professional development programme on the knowledge and practice of secondary practitioners?* There are five theoretical questions (TQs) (Stake, 1995) or sub-questions which are displayed in Figure 4.4. These are derived from the gaps that I have found and previously documented in the literature. For example, earlier, I identified that the literature was not helpful in establishing beyond that of being 'generically useful', the full range of reasons why educators used brain-based education. Accordingly, I argued earlier that one question for this inquiry should be why do or don't educators use brain-based teaching strategies/methodologies.

Sub-questions
TQ1. What understanding do secondary school practitioners have of brain-based education and its teaching strategies/methodologies?
TQ2. Was TEEP PD the only or main source of this knowledge?
TQ3. What brain-based teaching strategies/methodologies, if any, are used by secondary school practitioners and has this practice changed over time?
TQ5. How are brain-based teaching strategies/methodologies used by secondary school practitioners?
TQ5. Why do or don't secondary school practitioners use brain-based teaching strategies/methodologies?

Figure 4.4: The five sub-questions of this inquiry

Summary

To summarise, this chapter, which is the last of the three conceptual framework chapters, has accounted for the empirical literature as it related to the research problem. The chapter concluded by positioning the research study within the relevant knowledge and methodological gaps in the brain-based empirical literature. The research design chapter follows next.

Chapter 5: **Research Design Considerations**

In the previous chapter I claimed that the knowledge gaps in our understanding of brain-based education ostensibly equated to practice and knowledge issues. I documented the considerable gaps in our understanding of the use of brain-based education in the aspects of what, how and why. I made the case that there was uncertainty over the exact nature of the understanding/knowledge of brain-based education and its operational devices amongst educators. Accordingly, I formulated the research question to be *What was the impact of a brain-based education component of a professional development programme on the knowledge and practice of secondary practitioners?* To answer this, being mindful that the gaps mainly arise because the existing research focuses on outcomes rather than the process, I formulated the sub-questions as illustrated in Figure 4. 4. I have already claimed that the main methodological gap found occurred because much research was performed using mixed methods or quantitative approaches that privileged methods that relied on the self-reporting of participants. I proposed that the implication of this for my research was that a qualitative approach with multiple methods to enable triangulation would be warranted, at least in principle. It is these research questions and the methodological/method concerns that form the initial input to the research design process that this chapter seeks to document.

Simplistically speaking, the design aspect of any research project provides overall guidance for the collection and analysis of data (Churchill, 1979). Saunders, Lewis, and Thornhill (2009) provide a more sophisticated view by arguing that research design maps out a general plan of how to answer the research questions in addition to the careful consideration of why a particular strategy is to be pursued. As a researcher, I am cognisant of James and Vinnicombe's (2002) suggestion that I am likely to have inherent preferences that are, in turn, likely to influence my research design. Blaikie (2000) notes how such preferences form the basis of a sequence of choices that I must consider, and he shows the alignment that must connect these choices back to the original research problem. This is the overall aim of this chapter on research design.

To meet my espoused value of transparency (the rationale for this is presented later) and provide the 'big picture' at the most valuable point, I now supply a brief exemplification of the main dimensions of the research design. Framed within an interpretivist paradigm, the methodological position of this qualitative inquiry rests squarely on the use of the qualitative data collection methods of semi-structured interview, non-participant observation and documentary analysis. The analysis of the data was conducted using a thematic approach. The remainder of the chapter devotes itself to explaining how this research design was constructed to respond to the research questions, address the methodological gaps and privilege my inherent preferences.

Chapter overview

I use this chapter to discuss two key aspects of my research design considerations. Firstly, I discuss the philosophical assumptions about knowledge, reality and values that inform my research endeavours. Secondly, I discuss what resultant methodology was adopted to address the research questions posed in Chapter 4. This is followed by an examination of other key research design considerations, namely quality criteria and generalisation, and researcher involvement issues.

The lexicon of research design

Remenyi and Williams (1996) advise that establishing the basic theoretical/conceptual and philosophical framework for research can be challenging for the researcher. I expected to be challenged philosophically and theoretically, indeed, that was part of the attraction for me of undertaking the research. I did find ensuring the philosophical compatibility of the constituent aspects of the research design demanding. Nonetheless, I encountered another and unexpected challenge - that of fathoming out the shifting ground that constituted the lexicon of research design.

The meaning of 'methodology', for example, is difficult to ascertain as it is often used interchangeably with 'methods' leading to a blurring of the dimensions of reasoning behind research planning (Lapan, Quartaroli, & Riemer, 2012). Cresswell (2003) deems methodology to subsume notions of method, the approach to research and the theory of knowledge. This contravenes Hammond and Wellington's (2013) narrower framing of the construct to only concern the research framework. It appears that I am not alone in encountering this difficulty. Crotty (1998) observes that this inconsistent use of terminology when framing research design constructs is a wider issue:

> What one often finds, however, is that forms of these different process elements are thrown together in grab-bag style as if they were all comparable terms … Yet they are not truly comparable. Lumping them together without distinction is a bit like talking about putting tomato sauce, condiments and groceries in one basket. One feels compelled to say ... Let's do some sorting out here (Crotty, 1998, p. 3).

I think it helpful to provide clarification of my understanding of the key concepts that I draw on going forward. Doing some 'sorting out' as Crotty recommends also fulfils one of my stated axiological principles in this case, that of transparency (see the section on Axiology). Figure 5.1 presents the results of my sorting out.

Research Design is the framework for the generation of evidence that is suited both to a certain set of criteria for evaluating research and to the research question that I am interested in (Bryman, 2016)

My preferred conceptualisation of a **paradigm** it is a basic belief system or worldview that guides me (Guba and Lincoln, 1994)

Methodology refers to the rationale given for the application of particular research methods (Hammond and Wellington, 2013)

Methods are the separate and individual techniques or procedures I used to gather and analyse the data related to my research question (Crotty, 1998)

Epistemology is the theory of knowledge (Blaikie, 1993) and it asks the question: what is true and how do we come to establish that truth (Barger, 2001)

Ontology as a sub-field of metaphysics (how the world is), is concerned with nature of reality and is the "study of what there is" (Stanford Encyclopedia of Philosophy, 2017, para. 25)

Axiology is the branch of philosophy that explores the role of values or worth (Barger, 2001)

Figure 5.1 Summary of philosophical working definitions adopted

Philosophical framework

The parts of a philosophy system are ontology, epistemology and axiology and taken together with paradigms, they describe beliefs, assumptions, perceptions, the nature of reality and the knowledge of that reality (truth). On these matters, there is convergence around two points in the literature. The first is that the parts of any philosophy system must be compatible with each other (e.g. Barger, 2001; Flowers, 2009). Secondly, since the philosophy system can influence the way in which the research is undertaken, the researcher needs to explicitly and critically examine and justify the philosophical ideas their research incorporates (Carr, 1995). This is necessary "in order that approaches congruent to the nature and aims of the particular inquiry are adopted, and to ensure that researcher biases are understood, exposed, and minimised" (Flowers, 2009, p. 1).

Ontological position

I have aligned myself with the ontological position of subtle realism (Hammersley, 1992). I think that subtle realism best equates to my thoughts about the nature of reality – especially so when considering the content of my first reflexive vignette (see Example 5.1). Consistent with a constructivist approach (Andrews, 2012), subtle realism holds that reality is socially defined. However, this reality only refers to the subjective experience of normal day to day life - how the world is understood - rather than to the objective reality of the natural world. Hammersley (1992b) contends that the truth of any research account cannot be absolutely ascertained because there is no way to gain direct access to the reality it purports to represent. Instead, judging "the validity of claims [must be done] on the basis of the adequacy of the evidence offered in support of them" (Hammersley, 1992, p. 69). Furthermore, an account can be considered "valid or true if it accurately represents those features of the phenomenon that it is intended to describe, explain or theorise" (Hammersley, 1992, p. 69). This has direct implications both for research design in terms of the methodology, the methods used, and the choice of criteria employed to assess the quality of the research. I discuss the relationship between my ontological stance and the quality criteria later.

Being an espoused subtle realist researcher invokes several important implications for the research design process. Firstly, on the matter of paradigms, there was a requirement for a paradigm that privileged particular outcomes and settings. Specifically, on the former, these were the development of a rich and complete understanding of the interaction of practitioners within Westford with brain-based education. On the latter, to remain faithful to the ontology of subtle realism, the outcomes should emanate from as natural as setting as is possible, replete with its full complement of cultural and social aspects intact and undisturbed. There were also other implications which I consider next. Thinking forward to the next key decision level of research design i.e. method selection, I was aware that the main data collection methods that accorded with subtle realism were those that elicited participant's ways of knowing and seeing their reality. Such data collection methods include interviews, observations, and documentary scrutiny (Cohen & Crabtree, 2006). Supplementary to the use of these methods, I appreciated that I would also need to incorporate as many of the research strategies that are held to be supportive of conducting research aiming to have a subtle realist orientation into the research design. These are reported in Figure 5.2.

Having outlined my stance regarding ontology and discussed its implications for my research design, I next repeat the process for epistemology.

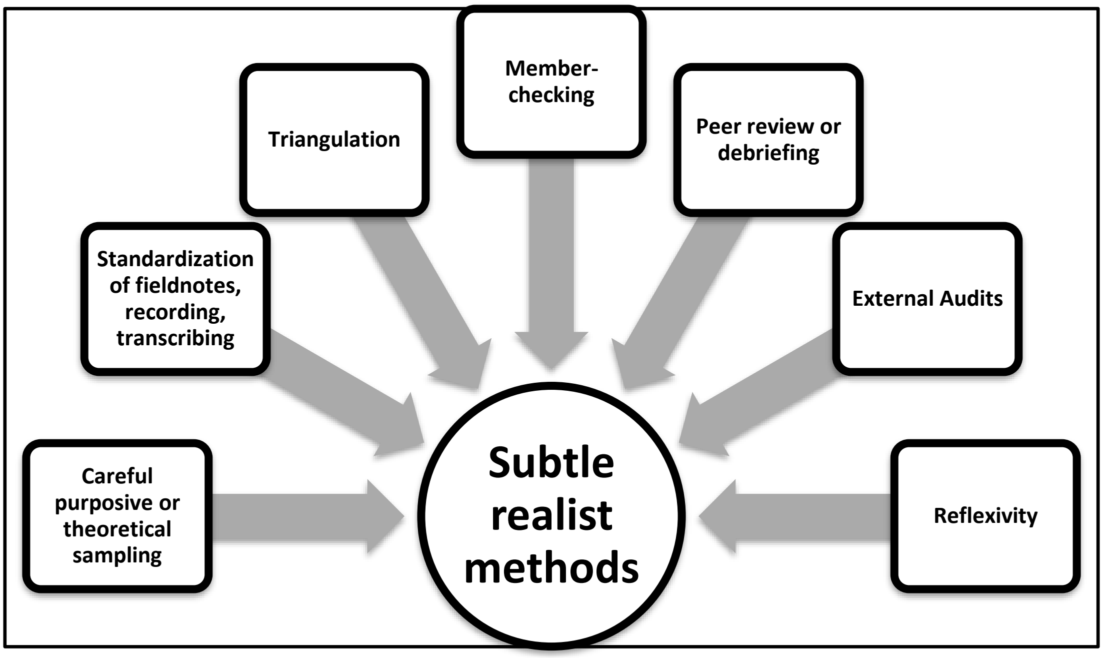


Figure 5.2: A summary of research strategies compatible with research that has a subtle realist stance (Cohen & Crabtree, 2006, para. 18)

Epistemological position

I contend that all the knowledge we acquire is a direct result of the interaction between the known and the knower. Mutually, the investigator and the investigated connected (Howell, 2013) and are both 'altered' by their intercommunication. The consequence of this interaction is time and context-bound knowledge. Furthermore, it is impossible to separate cause from effect, as all entities are in a state of concurrent shaping. The important consequence of this for me is that the research findings are created during the research process. On account of these views, I hold a transactional or subjectivist epistemological position (Lincoln & Guba, 1985). This means that "the results of the investigation are a product of interaction between the subject and the investigator. What can be known is a result of the interaction" (Pickard, 2013, p. 7). I explain how this epistemological stance is congruent with subtle realism in the next section. That being said, the implications of this epistemological stance for my research design was that the paradigm of interpretivism appeared to offer me the most philosophical congruency. Furthermore, and drawing on the preceding ontological discussion, I was aware that any selected methodology needed to incorporate the use of naturalistic methods. This was primarily so that I could enable an adequate dialogue between myself and my participants to collaboratively construct a meaningful reality. In practice at the method level, this suggests the use of interviews, observations and analysis of existing texts (Cohen & Crabtree, 2006). Having outlined my stance concerning epistemology and discussed its implications for my research design, I next repeat the process for axiology.

Axiological position

My axiological position is firstly that my values cannot be bracketed to understand the phenomenon I am investigating. Moreover, I agree with (Heron, 1996) who argues that researchers should demonstrate axiological skills. According to Heron, I can demonstrate my axiological skills in two ways. Firstly, by articulating the effect that my values have had on the conduct of the research and secondly by setting out an axiological statement in relation to the topic of investigation. I have done the former by way of axiological vignettes, in much the same way that I have included reflexive vignettes at pertinent points in the text, and the latter is presented in Table 5.1. The values listed in Table 5.1 have been arrived at through a variety of mechanisms, including predominantly life experience and introspection.

Table 5.1: Statement of key personal values

Statement of personal values	
Truth	Dignity/respect/integrity/courtesy
Knowledge/learning/wisdom/reflection	Openness/transparency/candour/personal interaction
Fairness/balance/impartiality/ reasonableness	Honesty/responsibility
Diligence	Flexibility

Having explained my stances on ontology, epistemology and axiology I now seek to demonstrate the coherence of my philosophical system to avoid any undermining of my final work (Blaikie, 2000). It may appear that subtle realism and subjectivism do not fully logically mesh together (Maxwell, 2011). Maxwell (2011) goes onto argue that "qualitative research can be conducted from a number of different ontological and epistemological perspectives … [and] that there are significant advantages to incorporating diverse, even 'contradictory' epistemologies in one's conceptualisation and practice of qualitative research" (p. 11). Abbott (2001, 2004) suggests that ontological and epistemological views are heuristics or resources that enable me to get my job done. Thus, it is his contention that an excessive focus on logical consistency is redundant. Hammersley (1992) similarly contended that prima facie incompatible epistemologies and ontologies were not necessarily problematic. These arguments, I feel, justify why I have concluded that I can proceed to the next design stage with my subtle realist ontological outlook, my subjectivist epistemology and my axiological position that my values cannot be suspended.

Paradigm: interpretivism

I adopted Guba and Lincoln (1994's) advice on research design that, "Questions of method are secondary to questions of paradigm" (p. 105). Bryman and Bell (2003) contend that the research paradigm has implications for the design in that the choice of methodology for a project needs to be guided by how the researcher views the nature of reality, how they believe knowledge about reality can be understood and what role their values play. Avoiding the temptation to view a paradigm as an entity that can be easily 'adopted' or 'selected' has proved difficult given the penchant some of the literature has for suggesting that paradigm appropriation is acceptable. The paradigm that accords most closely with my personal philosophical system described earlier that is that of interpretivism. The origins of interpretivism reside with Max Weber and his notion of *verstehen* which means to understand something in its context (Holloway, 1997). Interpretivism is predicated on the viewpoint that humans are relatively plastic, that human nature is not fixed and therefore that there is no best social order for society. Interpretivist claims to *verstehen*, the emphasis of understanding over judgment, leads to the primacy of the ability to make or construct meaning. Accordingly, the axiom that individuals cannot and should not be subject to reductionism, and any attempts at so doing can be rejected on ethical and epistemological grounds led Lincoln and Guba (1985, 1988) to suggest that this post-positivistic paradigm is best embodied in naturalistic inquiries.

Adopting an interpretivist paradigm meant that I gave primacy to methodologies that were the most naturalistic in nature and hence qualitative. I took Gray's (2013) assertion that “the types of research methods usually selected by naturalistic inquirers involve those most closely associated with a human component: interviewing, participant observation, document and content analysis (and other forms of unobtrusive measures)” (p. 27) forward to the methods selection phase.

Reflexive vignette No.1.
I have through gone somewhat of a personal paradigm readjustment during my doctoral studies. Graduating with a first degree in Manufacturing Engineering having pursued exclusively scientific A-Levels more latterly working as a Physics teacher, I spent the formative years of my career unquestioningly immersed within the positivistic tradition, unaware of the existence of any alternatives and unknowingly steeped in its assumptions. Hahn sums up what was for me the norm, “For there is but one science, and wherever there is scientific investigation it proceeds ultimately according to the same methods; only we see everything with the greatest clarity in the case of physics, most scientific of all the sciences” (Hahn, 1933, 1959, p. 147, as cited in Packer, 2011). However, the philosophical reading and thinking required for this thesis has led to me re-evaluate the scientific paradigm that has to date shaped my understanding of ‘how we come to know’ and ‘what we can know’. This re-evaluation, which is discussed above has resulted in me replacing this with an interpretivist worldview.

Example 5.1: Reflexive vignette No.1

Methodology: Qualitative inquiry

I wanted a methodology that would allow me to use more than one technique. I also wanted a methodology that allowed me to have some degree of latitude and flexibility with my selection of methods, rather than feeling I was being straitjacketed into a predetermined assemblage of techniques. This accords with my axiological position in relation to the value I place in flexibility. I concluded that the most appropriate, effective and philosophically congruent methodology to be employed for my research endeavour, which is situated within the interpretivist paradigm and which ostensibly seeks answers to a series of what, how and why questions in the context of educator knowledge and practice of brain-based teaching strategies/ methodologies, to be that of a generic qualitative inquiry. This decision is supported by the conclusion reached by Rossman and Rallis (1998) about good quality qualitative research, which they consider to be emergent, conducted in natural settings, interactive and humanistic, reflexive, mostly inductive, broad and panoramic, yet most importantly of all, interpretivist.

I next explain how I incorporated quality measures into my research design to optimise its trustworthiness. I also explain how I have dealt with the main potential criticism of interpretivism i.e. its lack of generalisability.

Design issues: Criticism and quality

By adhering to the interpretivist paradigm which is operationalised through a qualitative approach my research may be open to several positivistic/quantitatively orientated criticisms. These may include the inability to distinguish between cause and effect, the lack of generalisability, the value-laden approach to the research process and its output and the belief in multiple, constructed realities (Bergman, 2008). For this research study, I have taken the position that the benefits accruing from researching within the interpretivist paradigm have far outweighed most, if not all, of any of these alleged limitations or inadequacies. Whilst all these criticisms are to a larger or lesser degree legitimate, depending on your paradigmatic point of view, nevertheless, I feel that the most important of these criticisms is that my findings will lack generalisability. I contend that the pursuit of generalisability is not the intended purpose of interpretivist work, however, but rather the intended outcome of my research was to achieve 'fuzzy generalisation' (Bassey, 1981). In the following section I explain how the concept of fuzzy generalisation relates to my research and describe its implications for the research design. Since they are a precursor to the discussion of generalisation I start the next section off by documenting how I incorporated quality measures into my research design.

Trustworthiness

Purposefully incorporating quality measures into qualitative research at the design stage is important because they underpin the final assessment of merit that can be ascribed to the study. As Angen (2000) observes "Designing and carrying out effective and valid research are the desired goals of all researchers and demonstrating the trustworthiness of one's dissertation research is a requirement for all doctoral candidates" (p. 378). As a qualitative researcher, achieving this is not as straightforward as it appears because there is no settlement on "what it means to do valid research in the field of qualitative inquiry" (Angen, 2000). I found myself in agreement with those who argued that the established positivist/quantitative quality criteria are philosophically at odds with the fundamental nature of interpretivism (Jardine, 1994; Sandelowski, 1993;

Smith, 1984). To be frank, since interpretivism produces findings that are context-specific and conditional, the direct application of the constructs of internal validity, reliability and external validity (generalisability), as suggested by for example LeCompte and Goetz (1982) and Mason (1996), presented itself as something of an anathema to me. Even though I am exposed to the accusation of Schwandt (1996) that I am following the cult of criteriology - a preoccupation with criteria that become "the regulative norms for removing doubt and settling disputes about what is correct and incorrect, true or false" (p. 59) - of the two remaining solutions presented in the discourse I opted for the 'reject and replace' approach of Lincoln and Guba (1985) and Guba and Lincoln (1994). They formulated two quality criteria, trustworthiness and authenticity, but trustworthiness has become the main indicator of quality. Guba and Lincoln (1994)'s construct of authenticity spans ideas of fairness, ontology, empathy, empowerment and change. Whilst seen as interesting and having an affinity with action research, the proposal of authenticity has had insignificant impact in the domain (Bryman, 2016). There are four elements to trustworthiness; credibility, transferability, dependability, and confirmability. I explain the basis of each of these alongside my assessment of its implications for my research design in Table 5.2.

Even though they may originate from a positivistic worldview as Lincoln (1995) later admitted, I find myself in agreement with her when she continued her advocacy for these quality criteria arguing "interpretivist inquiry requires as serious a consideration of systematic, thorough, conscious method as does empiricist inquiry" (Lincoln, 1995, p. 400). I consider that the matter of transferability and its relationship to the notion of generalisability needs a more detailed consideration than I have afforded it above. In the following section, I explore generalisability and make a case to use Bassey's (1981) construct of fuzzy generalisation to assess the transferability of the findings of this research.

Table 5.2: Summary of Lincoln and Guba's (1985)/ Guba and Lincoln's (1994) quality criteria (adapted from Bryman, 2016)

Name of criteria	**Description**	**Implications for research design**
Credibility	Establishing credibility requires that I have carried out the research according to the principles of good practice and also that I have	**Participant validation.** Interview transcripts of interviews were returned to the participants, so they could attest to their accuracy. Also, the non-participant observation data was

Name of criteria	Description	Implications for research design
	submitted the findings to participants so that they can verify that my understanding of accords with their understanding of the phenomenon under study.	briefly discussed with the participants for the same reason **Triangulation.** Triangulation is a process by which two or more methods of data collection are used to pursue a research objective where the analysis of the data generated leads to research outcomes that take cognisance of each data source and create a more holistic view (Cohen, Manion & Morrison, 2014). Triangulation also bridges notions of validity and reliability and it was a particularly helpful technique for me to use engaged as I was in the investigation of a complex phenomenon such as brain-based education. The use of multiple data sources and their subsequent triangulation ensured that any inconsistencies in data from any one method were checked against the data from the other two and if found to be inconsistent, investigated further, although this proved not to be the case.
Transferability	This relates to generalisability and is separated out for a separate examination below	
Dependability	An audit trail should be created that will enable others to establish to extent to which proper procedures have been followed.	I collected and retained all documentation (subject to data protection requirements) so that if required I could facilitate a peer audit, even though I anticipated that this was an unlikely event due to the time-consuming nature of such an enterprise.
Confirmability	A recognition that whilst complete objectivity cannot be avoided as a researcher I must demonstrate that I have acted in good faith. This means demonstrating that I did not unduly allowed my personal values or theoretical findings to unduly sway the conduct of the research and/or its findings.	My previously set out axiological position is that my values cannot be suspended during the research process. However, the section on researcher involvement issues sets out the actions adopted as a counterbalance to this as follows; 1. Positionality, 2. Reflexivity, and 3. Bias.

Fuzzy generalisation

Most simply, generalisability relates "to the feasibility of using an insight developed in one context and applying it in another" (Hammond & Wellington, 2013, p. 80). The original concept of generalisability is rooted in statistically orientated research.

Since qualitative research usually involves small sample sizes which are often not randomly selected, the findings tend to be heavily contextualised to the context of the study. Consequently, they have poor generalisability in the quantitative sense (Jackson, 1990). This conceptualisation of generalisability is thought to be particularly problematic for applied fields like education where it is asserted that it is not defensible or functional to conceive of generalisability in terms of sampling and statistical significance (Donmoyer, 1990). The inappropriateness of generalisability in such instances implicate such factors as the involvement of human agency, the lack of replication and the complexity of the context (Hammond & Wellington, 2013).

Scholarly efforts to reconcile generalisability and the concomitant 'snagging issues' outlined previously are manifold. They include those of Stake (1978) (naturalistic generalisations), Guba and Lincoln (1981, 1982); Lincoln and Guba (1985) (fittingness), Bassey (1981, 2001) (relatability) and Goetz and LeCompte (1984) (translatability and comparability). I have chosen to draw on Bassey's (1981) notion of fuzzy generalisation rather than Lincoln and Guba (1985)/ Guba and Lincoln (1994) because it offered me an assessment of the likeliness or unlikeliness that what I found "will be found in similar situations elsewhere: it is a qualitative measure" (Bassey, 1999, p. 12). Bassey contests that putting the readership in a place where they can assess this for themselves can only be achieved by the provision of detailed accounts and a skilful commentary. I have therefore reported the data analysis methods carefully, and provided thick descriptions of the findings (Geertz, 1973; Ryle, 1949) and my interpretation of them.

I next document the research design matters arising from me as a human being the primary data collection instrument (Lincoln & Guba, 1985). These are also implicated in the construct of confirmability introduced earlier.

Researcher involvement issues

If research represents a shared space, shaped by both researcher and participants (England, 1994), then the identities of both researcher and participants have the potential to impact the research process. This is especially true in a qualitative inquiry where the very nature of such an endeavour sets the researcher as *the* data collection instrument. Just as the participants' experiences are framed in social-cultural contexts, so too are those of the researcher. Consequently, it is not unreasonable to expect that the researcher's beliefs, political stance and cultural background (gender, race, class, socioeconomic status and educational background) will affect the research process. Taking this line of argument to its conclusion, the concept of self as a research instrument reflects the likelihood that the researcher's own subjectivity will come to bear on data collection and any subsequent reporting of findings. Nevertheless, often only the involvement and contribution of the participants is given its due in scholarly writing in terms of consideration and acknowledgement (Bentz & Shapiro, 1998). Male (2016) contends that in qualitative research, "the researcher is part of the activity" (p. 179). On this premise, ultimately, the 'fabric' of the research outcome is a jointly mediated endeavour whereby the contribution of the researcher's weft binds the participant's warp into a final artefact.

I have thus recognised my role and its potential impact on my research in terms of the overall trustworthiness. During the journey, I have acquired an appreciation that as a researcher I have left my own signature on the project by bringing my personal subjectivities to the task. The idiom, 'the elephant in the room' comes to mind here for me, as it illuminates the way researchers tend to avoid discussing the full extent of their impact as an 'includant' on their own research, with many researchers paying it scant attention or, worse still, conveniently pretending not to notice it. I am mindful of the need to avoid falling into the same trap. I thus offer an exploration of the issues relating to me as an includant in the research rubric that are potentially problematic because they impinge on the overall trustworthiness the research findings. This process commences with me explaining how and why these subjectivities may arise (my positionality). At this point, I introduce the concept of 'insider/outsiderness' as an additional dimension of my positionality. I follow on by explaining how I examine my resulting beliefs, judgements and practices. I also consider how they may have affected the research using the process of reflexivity (Hammond & Wellington, 2013). I conclude the section on my influence on-and-in the research rubric with an examination of the potential for bias. Bias is deemed to be the ways in which there may be a lack of objectivity in my identification of problems and the collection and interpretation of data as a result my prejudices (Hammond & Wellington, 2013). Included within this discussion of bias is an outline of the steps I have taken to negate its impact on the study's trustworthiness.

Positionality

Whilst perspective refers to the context which influences what a person can see and how they interpret it and includes notions of ideology and value systems, positionality is a much narrower construct, limited to the social value landscape inhabited by a researcher (Chiseri-Strater, 1996). She argues that "All researchers are positioned by age, gender, race, class nationality, intuitional affiliations historical-personal circumstances and intellectual predispositions" (p. 115); moreover, these translate into maps of consciousness (Haraway, 1991). The famous corollary of Durkheim's (1938) proposition that social facts are things, which calls for preconceptions or values to be eradicated, represents a traditional and positivistic outlook on the relationship between researcher values and the research they conduct (Hammond & Wellington, 2013). Subsequent contenders deem that this aspiration to achieve a God's eye view (Haraway, 1989) or indeed, occupy a view from nowhere (Nagel, 1989) are virtually impossible to achieve in any practical sense (Cousin, 2010; Hammond & Wellington, 2013). Now it is widely accepted by the research community that values can and do intrude upon any or all the research phases. Indeed, I have already argued in the section on my axiological position that I cannot suspend my values during the course of this inquiry. Consequently, this research cannot be bias or value free (Bryman, 2016).

It is suggested that these positionality attributes should be disclosed by the researcher so that readers can at least be alerted to their presence (Chiseri-Strater, 1996; Hammond & Wellington, 2013). Turnbull provides a simple yet compelling account of why this proposition has merit thus "The reader is entitled to know something of the aims, expectations, hopes and attitudes that the writer has brought to the field with him [sic], for these will surely influence not only how he sees things but even what he sees" (Turnbull, 1973, p. 13). Implicit within Turnbull's account is how positionality and reflexivity interlink: a positionality statement is of little use on its own – researchers must also articulate how positionality has shaped the conduct of the project (Hammond and Wellington, 2013). Heeding this advice then, I summarise my positionality in Example 5.2.

The intention of my account in Example 5.2 is to allow the readership to acquire full cognisance of my positionality in terms of my social, political and cultural context. It is further offered in appreciation of the fact that not to have a position at all or indeed to declare it is probably a worse predicament still for it leads to a "state of mental dissociation and disintegration" (Hammond and Wellington, 2013, p. 120). The occupation of such a place is undoubtedly what I as a developing researcher I have sought to avoid. More fundamentally though, I concur with Hall's position on positionality "There's no enunciation without positionality. You have to position yourself somewhere in order to say anything at all" (Hall, 1990, p. 18).

In the next section, I document one particularly pertinent facet of positionality, that of insiderness and outsiderness.

Positionality Statement

I am a white, middle-class, middle-aged female who has had a lengthy professional career in education that has spanned across a number of different LAs, schools and positions of responsibility: the two most recent positions in LA school improvement afforded me an insight into the inside workings of two very different northern LAs, the DfE through SNS – the then contracted executor of the government's education policies - as well as a cross-sectional view from a senior level across the estate of secondary schools in each LA.

I was acutely aware of the wider educational and political agenda and how this translated into school improvement pressure at the school and LA level. My experience as a practising teacher similarly made me profoundly aware of the normal day-to-day life of a teacher and how the pressures enacted themselves at teacher level. As an LA SIO, I worked with teachers to develop their teaching skills and therefore was conversant with what "good teaching and learning" was defined to be, at least by those with power.

Although an external observer might consider that my position came with power, I always felt that the balance of power lay with those in schools. I wielded no direct authority and could only advise and persuade teachers to enact my advice.

Example 5.2: A statement on my positionality as a researcher

Insider /outsider issues

This sub-section serves to set the context in terms of my positionality as a researcher in terms of the insider/outsider discourse. Because of the way it is presented, it demonstrates how I developed my 'reflexive intelligence'. Accordingly, I contend that this forms part of my reflexive account. I expand on the notion of reflexivity later, but for now, I offer the simple definition of reflexivity as "If positionality refers to what we know and believe, reflexivity is about what we do with this knowledge" (Hammond and Wellington, 2013, p. 129).

The notion of insider/outsider researcher status originated from the work of anthropologists and sociologists in the later part of the last century. At this time, there was a turn from the unfamiliar to the familiar caused by a re-situation of the study focus away from "their own culture, gender, religions, residential and ethnic backgrounds" (Hockey, 1993, p. 201). These anthropologists and sociologists concluded that "privileged" access to particular kinds of knowledge (Merton, 1972, p. 11) was afforded only to researchers who had a certain relationship with the groups under study. An insider is:

> someone whose biography (gender, race, class, sexual orientation and so on) gives her [sic] a lived familiarity with the group being researched' while the outsider is 'a researcher who does not have any intimate knowledge of the group being researched, prior to entry into the group (Griffith, 1998, p. 361).

The hegemony of positivism elevated being 'outside' the research setting to that of the privileged state (Schütz, 1964; Simmel, 1950). This is because "being a stranger, an outsider in the social setting, gives the researcher scope to stand back and abstract material from the research experience" (Burgess, 1984, p. 23). In contrast, insider researchers by their very definition are party to accusations of 'over' proximity to, and empathy with those occupants of the setting. This necessarily precludes them from attaining the distance and objectivity normally associated with valid and intellectually rigorous research (Alvesson, 2003; Anderson & Herr, 1999). It is contended that researchers in fact simultaneously occupy many positions in a continuum that consists of multiple dimensions and can shift between these positions with ease at any time during the research process:

> The binary implied in the insider/outsider debates, however, is less than real because it seeks to freeze positionalities in place and assumes that being an insider or outsider is a fixed attribute. The Insider/outsider binary, in reality, is a boundary that is not only highly unstable but also one that ignores the dynamism of positionalities in time and through space. No individual can consistently remain an insider and few ever remain complete outsiders. Endeavours to be either one or the other reflect elements of the dualistic thinking that structures much of Western thought (Mullings, 1999, p. 340).

Consequently, I was probably worthy of the title of 'plastic in-betweener' rather than wholly an insider or outsider per se. This is because I believe that I achieved an occupation of positional spaces whereby I was both within and without the perceptions of the researched (Hellawell, 2006). Moreover, and accordingly at various instances I invoked varying quantities of the useful qualities of empathy and alienation, in the sense of distancing or making strange (Hammersley, 1993). I believe that I achieved this in-betweenness because of my recent employment status with the LA. At the time of data collection, I was no longer an employee of Westford LA, i.e. excluded from day-to-day goings-on in the LA. I felt that this disqualified me from being afforded the status of an insider. Equally though, I felt that because the time elapsed since my departure was relatively short and because I had actively maintained my links with my former colleagues i.e. meeting up for coffee and other social events, neither was I a full outsider. Even though technically I had ‘left the building’ we still had shared professional memories and shared concerns over unfolding events in, and the direction of, the school improvement endeavour in the LA. Above all though, there was still a shared understanding of the uniqueness of what it was like to be an educator in Westford. In many ways, I was in a liminal position as my rite of passage from full insider to full outsider was incomplete. For me there were several occasions where this plastic in-betweenerness became particularly apparent and my reflexive accounts of these instances are now outlined (see Example 5.3).

Reflexive vignette No.2.

When I started my research, I deemed myself to be an insider writing the rather naïve and one- dimensional pronouncement, “I hope that my shared insider status with the participants will support the research outcomes by building rapport based on common experiences and encourage authentic disclosures”. Having progressed somewhat in terms of reflexive thinking and acquired a fuller understanding of the more complicated nature of my positionality and the relationship that I have had with members of the community being researched, I now contend that I occupied many positional spaces (Mullings,1999) or on the multitude of dimensions of the insider – outsider continuum during various stages of my research project.

Example 5.3: Reflexive vignette No.2

I began with a purposive sample of participants that I had existing access to through my previous employment networks. For these participants, there were no issues with access or any major political issues arising with any so-called ’gatekeepers’ (Lee, 1993). Gatekeepers are deemed to be those who control access to the participants. Participation is more likely when there is a sympathy with the purpose of the research knowing and/or trusting the researcher (Coggon, 2007). I attributed my previous professional and productive relationship with the initial purposive participants to the large uptake of participants at this phase. I considered myself a full insider in this aspect of access. Similarly, there were no major access issues to those participants who were located via the subsequent snowball sampling strategy. In the next section on reflexivity, I consider how I have or may have, as a result of my thus espoused positionality, affected the research project.

Reflexivity

To be a reflexive researcher means being explicitly and openly self-scrutinising of how your own social and value positions might have influenced the design, execution and interpretation of the theory, data, and conclusions (Greenbank, 2003; Griffiths, 1998). Others conceptualise reflexivity in an alternative way, namely as a self-conscious awareness of the relationship between the researcher and an 'other' (Chiseri-Strater, 1996; Merriam et al., 2001; Pillow, 2003). In sum, "If positionality refers to what we know and believe, reflexivity is about what we do with this knowledge" (Hammond & Wellington, 2013, p. 129). Clearly my efforts at reflexive accounts were subject to the same charges levied at my positionality articulation. However, by being analytical rather than confessional in my approach to reflexivity, I consider I have worked to mitigate any criticisms that otherwise may be levelled, as Elliott explains:

> The aim is therefore for researchers not simply to provide their readers with detailed confessional accounts of their experiences of conducting research, but rather to produce an analytic discussion of how their own theoretical and biographical perspective might impact on their relationship with research subjects, their interpretation of research evidence, and the form in which the research is presented (Elliott, 2005, p. 155).

Nor is it possible or desirable to provide a full account of all the reflexive decisions or judgements exercised that I have made during the course of my research. To have done so could have lead me into a kind of paralysis (Johnson & Duberley, 2003). On getting the right balance of disclosure, I found the advice offered by Hammond and Wellington (2013) particularly useful. This was to provide the reader with exemplifications of particularly pertinent reflexive issues. I have chosen to approach reflexivity in this thesis by way of in-situ vignettes, where I explicitly draw the reader's attention at the relevant point to my exercise of reflexivity. I consider my documented response to the challenge of dealing with the reflexive methodological and epistemic implications (Johnson & Duberley, 2000) of insider/outsider research part of this exercise of implicit reflexivity.

Bias

As already stated, the disclosure of my positionality and my associated exercise of reflexivity are a key feature of my research. With these two important matters in mind, I turn now to another closely related concept, that of bias. Bias is something that I have purposefully strived to eradicate because it is generally seen as a negative feature, as something that can and should be avoided. As Bentz and Shapiro (1998) contend, however, bias can never be fully eradicated. For this reason, Ritchie, Lewis, McNaughton

Nicholls, and Ormston (2014) argue that all researchers should “reflect upon potential sources of bias and report these alongside technical details of a study’s conduct” (p. 23). Bias is a polysemic term and hence it within the context of research design it is not straightforward. It involves the contested concepts of ‘truth’ and ‘objectivity’ therefore relying on foundationalist epistemological assumptions that have previously been called into question (Gillies, 1993; Kuhn, 1970). Often it can describe the innocuous adoption of a particular perspective, from which some things become salient and others merge into the background. This framing of bias means that it can be seen in some circumstances as a positive feature. Typically, and more problematically, it can refer to systematic error in either a general or specific sense. It is the meaning in the specific sense that I use bias and by this I take it to mean one particular source of:

> systematic error that occurs from a conscious or unconscious tendency on the part of a researcher to produce data, and/or to interpret them, in a way that inclines towards erroneous conclusions which are in line with his or her commitments (Hammersley & Gomm, 1997, para 1.8).

Qualitative inquiry is often thought to be particularly prone to bias because “the researcher is the research instrument” (Hammersley & Gomm, 1997, para. 1.8). Researchers can inadvertently introduce bias into their research through several routes. For instance, by looking only for confirming evidence and overlooking or ignoring disconfirming evidence, or by reporting only some of the results and suppressing others. Bias, therefore, produces an otherwise a contorted view that is presented in such a way that the readership is not able to allow for this ‘leaning one way and unacknowledged prejudice’ (Hammond and Wellington, 2013, p. 14). Disclosure, as already stated, provides a major antidote to bias, as Griffith (1998) acknowledges:

> Bias comes not from having ethical and political positions – this is inevitable – but from not acknowledging them. Not only does such acknowledgment help to unmask any bias that is implicit in those views, but it helps to provide a way of responding critically and sensitively to the research (p. 133).

Hammond and Wellington (2013) consider that the stage of research design most likely to have been impacted by bias is the methods stage but others contend that the analysis stage is equally vulnerable. All my data collection, data analysis, and data interpretation were completed post-upgrade. I would argue that the repurposing of my mindset regarding bias, positionality and reflexivity following my upgrade guarded well against the threat of bias for the remainder of my research. Nonetheless, in keeping with my espoused value of transparency (see Table 5.1), I present an a posteriori exploration of the 'hot-spots' that were at risk to my biases. As with reflexivity, I present an indicative rather than exhaustive list. During the methods phase, in hindsight, I realised that;

1. During the observations, I may have taken an overly negative or positive position on individual educator's use of brain-based teaching strategies/methodologies and tacitly conveyed this to the educator,
2. During the unstructured observations, I may have 'seen' more use of brain-based teaching strategies/methodologies than was evident,
3. I may have designed the question framework to have leading questions and furthermore to have attributed an incorrect or distorted meaning to the participant's answers,
4. I may have only chosen educators who I knew use brain-based teaching strategies/methodologies to support this and my other pre-conceived notions about the prevalence of brain-based practices.

Seeking to eliminate or counter these potential biases I adopted the measures which are detailed below. I followed Kvale's (1996) and Bryman's (2016) advice on what constitutes a good interviewer to mitigate the risk of interviewer bias. For the observations, I considered that the optimum strategy to obtain a neutral assessment of the use of brain-based strategies therein was to video record them and then to jointly re-observe and discuss their content them with the educator concerned. Unfortunately, no educators were willing to opt for this as it would have meant a much more complicated permission process being adopted with the real danger being that the school declined to let the educator participate at all in the project. In the end, I opted for a simpler version which was to debrief the educator with my observation schedule to confirm that my observations were fair and representative. My question schedule was pretested by two colleagues to ensure that the questions were not leading. I was able to obtain participant verification for all but one of the transcripts which meant that it was unlikely that I could have attributed an incorrect or distorted meaning to the participant's answers. In terms of the last possible bias hot-spot identified, although I used purposive sampling to find my first batch of participants, I followed this up with snowball sampling. One third of my participants were selected using this later method. This provided me with reasonable reassurance that it was unlikely that I was selecting participants whose practice and knowledge of brain-based education supported my pre-conceived notions.

Reflexive vignette No.3

It would be fair to say that in the pre–upgrade stages of my doctorate I was potentially at risk of inadvertently introducing bias into my research and this was recognised by my examiners during my upgrade examination. When I started this research and to some extent throughout the original literature review I held some strong deficit views about brain-based education, particularly, as I then saw it, the spurious and fallacious use of brain-based teaching strategies by educators and even more so about their creators.

Part of my motivation for the project was that I wanted to establish the genuine scientific basis of these types of pedagogies and to find out why, despite the strong academic denouncement they attract, they appeared to remain popular in educational practitioner circles and apparently continued to receive institutional legitimisation. However, and since then, whilst pragmatically remaining aware that I cannot be fully detached from my research, post upgrade I have been especially "mindful" (Bentz and Shapiro, 1998, p.4) to counteract these prejudices to produce as valid a set of findings as is realistically possible.

Example 5.4: Reflexive vignette No.3

Despite these precautions, it is of course still possible that, there may be some small element of risk posed by unjustifiable researcher 'interpretation'. All the same, I feel that my revised awareness of my original biased stance, my theoretical and bibliographical perspectives have served instead to contribute towards a high level of authenticity and trustworthiness. This narrative on bias completes the section which considers my status as an includant in the research rubric, and what its implications were for the research design.

Summary

I have used this chapter to discuss the two major aspects of the research design. Firstly, I have discussed the philosophical and methodological framework that provided the theoretical background for the endeavour. Secondly, I have discussed the resultant methodology that I adopted to address the research questions posed in Chapter 4. I have examined other key research design aspects; quality criteria and generalisation, and the researcher involvement issues of positionality, insiderness and outsiderness, reflexivity and bias. In the next chapter I document how this work was operationalised in terms of the selection of appropriate data collection methods.

Chapter 6: **Data Methods and Ethics**

Apparently, "Most of us have conducted interviews" (Bogdan & Biklen, 1992, p. 96). Atkinson and Silverman's (1997) expression 'interview society' reflects this pervasiveness of the interview beyond the research context. In a qualitative empirical context, Packer (2011) contends that interviews are "standard practice" and "ubiquitous" (p. 42). For many researchers, whose efforts span the wide array of qualitative methodologies and subject disciplines, interviews are frequently relied upon as the sole source of data (Adams et al., 2002; Packer, 2011; Silverman, 2017). That being said, the use of multiple data sources is a preferable research strategy because it enhances data credibility (Patton, 1990; Yin, 2003). The credibility of the research is improved because the deployment of, for example, documentary analysis and observations alongside interviews affords the researcher the facility to triangulate their data (McEwan & McEwan, 2003; Miles & Huberman, 1994).

Thomas (2015) uses Foucault's (1981) notion of a 'polyhedron of intelligibility' to advocate that researchers should "'drill down' as deep as we possibly can … [because] in looking from several directions, a more rounded, richer, more balanced view of our subject is developed" (pp. 4-5). Motivated by the aim of securing a meaningful answer to the research questions and cognizant of the earlier philosophical discussions, for me this meant approaching the investigation from as many varied data types as was permissible and practicable. Consequently, this qualitative enquiry made use of multiple data sources collected using an array of methods crossing both the obtrusive and unobtrusive divide. Obtrusive and unobtrusive methods are differentiated based on whether another human (the researcher) is present at the point of data collection (Lincoln & Guba, 1985). As qualitative or 'naturalistic' research is non-interventionist in nature (Smith, 1990), to maintain theoretical congruency, I only used individual data collection methods that reflected this stance. The obtrusive data collection methods comprised 15 interviews and four non-participant observations. Documentary analysis on 72 documents constituted the unobtrusive data collection methods.

Chapter overview

Framed within a theoretical discussion of the use of interviewing as a qualitative data collection tool, I begin the chapter by explaining why I selected the method of semi-structured interviews as my primary technique. Following this, I advance an overview of the procedural aspects of the interviews themselves. In the section on semi-structured interviews I conclude with an outline of how the 'early' data analysis took place during the process of transcription. Next, I discuss non-participant observations. My exposition of this second data collection method commences by framing non-participant observations within its theoretical literature. I conclude this section with an overview of the procedural aspects of the four non-participant observations themselves. In *Method 3: Document analysis* I explain my use of the data collection method of document analysis. In the second substantive part of the chapter I consider the matter of ethics. The section on ethics is divided into two parts. The first part offers complete details of my ethical position. The second part explains how this transacted itself terms of the ethical practices and procedures that I adopted whilst carrying out this research project.

Method 1: Semi-structured interviews

I selected semi-structured interviews as the primary source of data collection for two reasons. Firstly, they provide a complementary epistemological platform for qualitative data gathering (Packer, 2011). Secondly and more importantly, as Walsham (2006) confirms, interviews are included as a part of most interpretative studies as they provide an effective mechanism for accessing the interpretations of participants in the field. My immediate task was to select a qualitative interview type from the not inconsiderable list presented in the methods literature. This was not altogether as straight forward as it initially appeared. There is relative consensus amongst scholars on the demarcation between qualitative and quantitative interviews. However, commentators seem unable to reach a consensus on the exact type and range of qualitative interviews (Cohen, Manion, & Morrison, 2011). The two main types of qualitative interviews, unstructured and semi-structured, appear to be differentiated by the extent to which the questions are open-ended and pre-determined in advance by the interviewer (Bryman, 2016). Unstructured interviews are more conversational (Burgess, 1984), and typically have either no pre-formulated questions or just one opening question. The prospect of guiding the interview solely with prompts from an aide memoire (Bryman, 2016) filled me with some trepidation. I was concerned that although providing me with the potential to "understand the world from the subject's point of view, to unfold the meaning of the subject's experiences, to uncover their lived world" (Kvale & Brinkman, 2009, p. 1), such an approach had an elevated risk of going wrong and leaving me with no or little useable data. As a neophyte interviewer, I appreciated that one limitation of the interview technique is that it demands a certain level of skill (Bloomberg & Volpe, 2012). To be a successful data collection exercise, the conduct of a qualitative interview required me to meet two conditions. Firstly, that I as the interviewer understood what constitutes a good interview in terms of its interpersonal, interactional, communicative, and emotional aspects (Cohen et al., 2011). Secondly, I needed to be able to operationalise these in a live face-to-face encounter.

Untested in such a high-stakes context, I chose to play things safe. I struck a balance between a structured or standardised (quantitative) interview (Mishler, 1986) where no deviation is permitted from a schedule of a priori questions to ensure optimum reliability and validity (Suchman & Jordan, 1990) and an unstructured interview, which is characterised by open-ended questions. Semi-structured interviews allow a much greater focus on the interviewees own perspectives, and participants are to some extent encouraged to elaborate or even go off at a tangent (Bryman, 2016). This was a feature that I deemed highly important given the deficiencies in the existing empirical research arising as a consequence of its overt focus on outcomes over processes and its limited use of interviews as a data method (see Chapter 4). Rather than being a "cool, distant, and rational interviewer" (Fontana & Frey, 2000, p. 653) I favoured the affordance provided by qualitative interviews to introduce my personality into the social, interpersonal exercise that constitutes an interview (Cohen et al., 2011). Moreover, I was attracted by their inherent flexibility, gained it must be said, at expense of control and therefore trustworthiness.

The possibility of asking new questions, following up replies, departing from the schedule to ensure that topics central to the research were covered, and the option of re-interviewing were all influential advantages that swayed my decision-making process. Semi-structured interviews allowed me all of these possibilities but with the crucial added bonus of a safety blanket (i.e. some pre-determined questions, along with follow-up prompts) should it all go awry on the day. Without this capacity to probe the responses, any data that I had collected was at risk of being 'thin', under-developed. To stay true to the tenets of interpretivism and moreover to meet my aim to move beyond an understanding of outcomes and acquire an understanding of processes involved in practitioners' interaction with brain-based education, being unable to catch the close-up reality, and elicit "thick description" (Geertz, 1973, p. 9) was certainly problematic. I was also influenced by considerations of to what extent an unstructured interview would live up to the expectations of the participants. I wondered if, having agreed to give up some of their valuable time they may feel cheated by the lack of structure or indeed whether they would think me unprepared if I appeared to be making it up as I went along.

Ultimately, knowing that I was adopting the interview type deemed the workhorse of qualitative interviews (Packer, 2011) further reassured me that I had opted for the safest course of action.

My next decision following on from the 'in-principle' use of a semi-structured format concerned the mode of its application. I rejected focus group interviewing (also known as group interviewing) (Bryman, 2016) opting instead for individual in-depth interviews (DiCicco-Bloom & Crabtree, 2006). Focus groups allow multiple participants, usually at least four, to share their knowledge or experience about a specific subject in an informal joint forum (Barbour & Kitzinger, 1999; Merton, Fiske, & Kendall, 1956). Focus groups are helpful for exploring people's knowledge as well as their points of view and how they are constructed (Kitzinger & Barbour, 1999). They provide the advantage of allowing a group to collectively construct their own understanding of a phenomenon. Hence, focus groups are fully congruent with interpretivism. Nonetheless, I concluded that such an approach would not provide participant anonymity. Nor would it provide participants with the opportunity to speak freely, openly, and potentially critically of the institutions involved (the schools and the LA), or indeed, the other participants, without fear of potential repercussions. I considered that the main advantage of a focus group approach, namely that it would allow me to tap into a wider range of experience than otherwise (Adams et al., 2002), was offset by its disadvantages. This increased negativity perhaps was a by-product of my own less than satisfactory experience as a focus group participant. My historic focus group experiences were unrewarding and unpleasant, mainly because the interviewers accepted the first and/or loudest answer. I had no wish to inflict a similar experience on my participants. The major theoretical disadvantage as I conceived it was based on its quasi-public nature. I felt that a focus group approach would prevent me from delving deeply enough into each individual's world to remain faithful to the emphasis placed by interpretivism on understanding the phenomenon from the participant's perspective (Johnson, 2002; Rubin & Rubin, 2005). I was especially keen to find out about the participants' knowledge and I thought that they would prefer to discuss their personal knowledge in a one-to-one situation.

Although it is asserted that focus groups "give rise synergistically to insights and solutions that would not come about without them" (Patton, 2002, p. 16) my experiences led me to believe otherwise. The focus groups that I experienced typically defaulted to group-thinking and/or satisficing. Group-think is a term used by Irving Janis (1972) to describe the process whereby a group of individuals reach a consensus, usually defective, because different views are suppressed or ignored by the group. Satisficing was originally proposed by Simon (1956) as a cognitive heuristic involved in decision-making. It was later developed by Krosnick (1999) in the context of interviewing, to describe instances where participants reduce the effort they expend in giving answers in interviews. When participants satisfice, they offer the first answers that come to mind that seem reasonable to the interviewer without attempt to engage in deeper cognitive processing. Although originally conceived in terms of quantitative interviews i.e. surveys, this phenomenon could be manifested in group interviews whereby the participants agree with statements and/or opt for safe answers. The occurrence of either or both events, even if not on a grand scale, could have rendered the data thus collected distorted and potentially unsafe. I concluded that although more time-consuming to undertake and transcribe, individual interviews were the only feasible solution to acquiring the deep, personalised and uninhibited responses from the participants that I was seeking. Having presented a rationale for both the type and format of interview selected from the large array of possibilities I next explain how I approached sample selection.

Sampling method and size

The initial sampling strategy employed was that of purposive sampling. Using this selection of knowledgeable people (Cohen et al., 2011), I subsequently applied a snowballing sampling strategy to further identify participants who demonstrated the relevant characteristics for inclusion. At this point I clarify the matter of anonymity because the opening statement potentially contradicts the emphasis that I have placed on anonymity elsewhere. I reconcile it on the following basis. The participants who offered up leads for me to follow had no way of knowing whether I approached the leads or not. They also do not know which approached leads agreed to participate. The only way the original purposive sample would be able to find out which of their suggestions took part would be to ask all those they recommended. In which case, disclosure is then devolved to the 'recommendees'.

The use of more than one sampling method, of which one includes a purposive sample is commonly adopted in social science research (Bryman, 2016). In the tradition of qualitative research, the overarching selection criteria used to identify participants is, more importantly, a willingness to participate. 'Knowledgeable' in the context of this research means those educators who are personally known to me because I worked with them on school improvement activities during my time in the LA: these ex-colleagues were influential in either the LA, or in their schools by virtue of possessing substantial teaching and/or teaching and learning consulting experience, and/or have been involved in the TEEP project and/or were deemed to be excellent teachers by Ofsted and/or their peers. They had mastered the "complex and diverse demands, knowledge bases and contexts for teaching" (Martinez (2003) as cited in Ferguson-Patrick, 2018) and had moved well beyond the 'reality shock' (the experience that typically besets neophyte educators (Veenman, 1984) or as I frame it in this case, the difficult teaching experience that typically faces educators new to Westford LA. In sum, these were the 'go-to' practitioners whose opinions, understanding and practice of teaching that I trusted. In effect, they are what Bernard (2011) deemed to be key informants, namely an expert source of information in a particular domain. A purposive sampling strategy enabled me to handpick the participants to be included in the sample to represent those with possession of the favoured characteristics (Cohen et al., 2011). Purposive sampling may not necessarily have provided me with participants who were representative or comments that may not have been readily generalisable. Purposive sampling did however, enable me to target those participants who were able and willing to provide in-depth information on the matters of interest to me (Ball, 1990), namely the impact that PD on brain-based education had had on their knowledge and practice. Table 6.1 shows how this group were named and defined.

Table 6.1: Analysis of participant sample

Location	**Type of personnel**	**Number in initial purposive sample**	**Number in final sample**
Schools	Teachers	2	4
Schools	Senior Leadership Team	3	5
LA	School Improvement Team	6	6

I stratified the population sample into groupings to demonstrate the mix of participants from across the entire range of permissible roles and responsibilities, working locations and experiences across what was a large, interconnected, and complex organisation. Table 6.1 contains the results of this stratification exercise. The categories represented a full cross-section of the main types of school facing personnel then working in education in Westford LA. The LA practitioner category was confined to those who had regular and hands-on teaching contact with school staff as part of their LA role. They worked at an operational level with a specialist area of curricular expertise and their generic title was SIO. The categorisation did not include more senior LA staff because their involvement with schools took place at a strategic level, for example, Heads and Assistant Heads of Service and these colleagues did not get involved with matters of teaching.

Executing qualitative research placed me in the position where I had to manage the a priori problem of how many participants would be necessary to secure theoretical saturation (Bryman, 2016). I found that this difficulty was compounded by the fact that the criteria for recognising or establishing when or whether saturation has been achieved was rarely articulated in any depth (Baker & Edwards, 2014; Guest, MacQueen, & Namey, 2012). Theoretical saturation is the point achieved with sampling when each data category has been saturated. In practical terms, this equates to three conditions. Theoretical saturation occurs when no new or relevant data seems to be emerging relating to a category. Secondly, theoretical saturation occurs when the category is well developed in terms of its properties and/or dimensions indicative of variation or lastly, when the relationships amongst the categories are well established and validated (Strauss & Corbin, 1998). Onwuegbuzie and Collins (2007) advise that:

> In general, sample sizes in qualitative research should not be so small as to make it difficult to achieve data saturation, theoretical saturation or informational redundancy. At the same time, the sample should not be so large that it is difficult to undertake a deep, case-orientated analysis (p. 289).

Cognisant of Bryman's (2012) observation that qualitative researchers must understand that they are engaged in a delicate balancing act and, Morse, Barrett, Mayan, Olsen, and Spiers' (2002) advice that as the study proceeds new subjects may emerge, I adopted Crouch and McKenzie's (2006) preference for sample sizes of less than 20. Small sample sizes, they argue, allow for the creation of close involvement with the participants and the generation of fine-grained data, both of which resonate with the interpretivist stance I adopted. The planned for total sample size was in the region of 20 participants. I then used the snowball sampling method to increase my sample until I had reached the point where I considered that theoretical saturation occurred. Snowball sampling is a method that uses participants as informants to identify or put the researcher in contact with other participants who fit the qualification profile. Although the snowballing cycle can be repeated until the researcher acquires the sample size to reach theoretical saturation is attained (Bryman, 2016), I only needed to run the cycle once to achieve theoretical saturation. This occurred with the 15th participant. In the next section I discuss how I operationalised the selected data collection method of semi-structured interviews.

Procedural details

For reasons of consistency at the beginning of the interview process, I approached each interview with the same question/prompt/probe framework. This framework is reproduced in Appendix 6.1. I designed the opening interview questions to elicit basic contextual information about the role of the participant, their working context, and their background. These non-threatening questions were constructed with the intention of establishing a rapport with the participant. Kvale (1996) calls these dynamic questions. I had two types of dynamic questions, those finding out about the participant and an equivalently small series of questions about TEEP (the PD context).

I followed these dynamic questions with more detailed questions relating to the substantive part of the research. Kvale (1996) identifies these as thematic questions because they related specifically to the research focus. Each interview lasted for between 50 and 150 minutes, but typically their length was about 90 minutes. I guided the interviews with probes and prompts (Robson, 2008) as I felt necessary to obtain the rich and thick data required, and often just to keep it on track. With some of the interviewees I knew beforehand that the interview was taking place in a fixed amount of time. For example, a 60-minute free lesson slot was further reduced by meeting and greeting time at the front office, and the reverse at the interview close. For these limited time interviews, I knew that it unlikely that I would be able to get through all the questions in the time available. I also knew that there was very little scope for scheduling another follow-up interview so as Pitney and Parker (2009) suggest when you can't ask all your questions, I made an advance 'executive decision' about which questions to exclude. These comprised some of the dynamic questions relating to TEEP, rather than the participant dynamic questions. I knew that it was important to retain the demographic information elicited by these introductory questions, and that these were crucial in establishing the interview relationship and rapport so could not be sacrificed. On the day, I consciously tried to limit the amount of talking I did in the hope that I could get through more questions and allow the participants more talking time.

Although in principle all interviews covered the same set of questions, depending upon the direction of the conversation at the start of the interview, I had to be flexible and varied with the order of the questions presented to the differing interviewees. According to Gall, Borg, and Gall (1996) this was an acceptable approach. They consider that the general interview guide approach involves outlining a set of topics to be explored with each participant but that the order in which the topics are explored, and the wording of the questions does not need to be predetermined. I recorded all the interviews with a digital recorder to enable later detailed transcription. I also made very brief notes during the interviews to allow conversation to flow as normally and freely as possible and so that I could actively listen to the participants rather than concentrate on writing. Most of the rooms where I conducted the interviews were private and were quiet enough to enable recording to take place and at their place of work. However, with a small number of participants, at their request to tie in with busy schedules, we met in local coffee shops. For these interviews, I purposefully used two recording devices to ensure that I was fully able to capture what had been said over and above the general background noise.

Early Data Analysis

As soon as was practicable after each encounter I transcribed each interview verbatim thus turning the data into a text-based format. There were two reasons for doing this. Firstly, this approach provided additional data security in that if for some reason the digital copy of the interview had become deleted or corrupted, I still had a backup paper copy to work with (Patton, 2002). Secondly, it was to facilitate an analysis process that was independent of me and transparent. I have decided to discuss the matter of transcription at this point in the thesis. In making this decision I have followed the lead of those who contend that the data analysis phase occurs simultaneously with the data collection phase (e.g. Ritchie et al., 2014; Schutt, 2012; Walliman, 2011).

LeCompte and Schensul (1999) suggest that such in-the-field analysis includes description and transcription and further that it may proceed in in a bottom–up or top-down fashion. Ideally the coding process would have followed on quickly from the transcription and participant checking phase, and certainly before the next interview to inform me in advance of subsequent interviews of the key issues emerging. I discuss the coding process in Chapter 7. In practice, however, this was not always possible, given time-consuming nature of interview transcription and the fact that I had needed to schedule all the interviews over a three-week period because of my own work commitments. Schutt (2012) asserts that data analysis can emerge even from the simple process of taking field notes. I adopted this alternative approach to early analysis by writing short memos after the interview sessions. These memos recorded my impressions of what had transpired, the key points of the interview, and my observations on how the questions had been reacted to and interpreted by each of the participants. I have included an extract from one of these memos in Example 6.1. This interview was one of the first I did, and I was very keen at the time not to miss anything out in case it proved important at the analysis phase – my memo writing improved as time went on.

10 February 2013 - Interview with Michael

Interview time = 2.5 hours. All questions answered in immense detail but what's relevant and not?

Spent too long on the first questions - my fault as I kept coming in with additional queries.

Fascinating bit about the Multiple Intelligences –they were going for an outcomes approach. But then how do you go for an input approach to providing Multiple Intelligences in the classroom? Is Multiple Intelligences a good idea but just hard to enact? Teachers want to do the right thing for their students even if it means trying out things they are suspicious of.

More general thoughts/observations

- TEEP bubble now burst – was popular – adopted more enthusiastically by schools with issues.
- Categories of participant? Where does [Michael] fit in? What are the characteristics of each category?
- VAK theory most popular operational device?
- Long debate about whether TEEP is/isn't formulaic – is this relevant?

Example 6.1: Excerpt of an early post-interview field memo

I was unable to synchronise the more systematic coding process with the data collection. In the absence of being able to synchronously data collect and code the field memos became a useful proxy that helped me refine and redirect my questioning as the interviews proceeded. As a result of them I was able to finesse my questions in order to maximise my understanding of the participant's meanings. Stake (1995) provides an initial theoretical justification for this action thus:

> We emphasize placing an interpreter in the field to observe the workings of the case, one who records objectively what is happening but simultaneously examines its meaning and redirects observation to refine or substantiate those meanings. The aim is to thoroughly understand [the case]. If early questions are not working, if new issues become apparent, the design is changed (p. 9).

I learnt from each piece of data and became better equipped to ask more focused questions as I continued the enquiry (Male, 2016). The "early hunches, hypotheses" (Simons, 2009, p. 17) or "interpretive asides" (Smith, 2010, p. 420) as to the meaning of the data that also formed part of my field notes cemented the commencement of the analytical phase of the project. I agree with Stake (1995) that qualitative data analysis is a reflexive and iterative process because by the final interviews, I found I had "a set of questions that became increasingly sophisticated as they become more focused by the findings" (Male, 2016, p. 180).

At the end of the transcription/early analysis process I was somewhat overwhelmed with the sheer amount of transcribed text that the interviews had generated. I took some solace knowing that one thing that there is almost universal agreement on is that the collection of qualitative data necessarily includes the creation of copious amounts of information (Bryman, 2016; Schutt, 2012). Some of this information will be irrelevant or unusable because it has nothing to do with the research focus (Auerbach & Silverstein, 2003, p. 37). This off-the-topic material has been termed 'dross' (Morse & Field, 1996). Gläser and Laudel (2013) explain how this inevitably occurs in qualitative inquiry:

> This 'dilution' of relevant information - the data - by irrelevant information is a necessary corollary of qualitative data collection because one of the latter's tenets is to assign a high degree of control of data generation to participants. Since the frames of reference and frames of relevance of participants are different from ours, they will also communicate information we don't need (n. p.).

Once each interview was fully transcribed, I then began the process of data cleansing to ensure that the interview transcripts did not contain any unnecessary, irrelevant, repeated or meaningless data. My goal was retaining only relevant text (Auerbach and Silverman, 2003). I then returned the prepared transcript to each of the participants along with the offer of a digital copy of the interview. I asked them to inform me of any errors or misunderstandings on my part as well as if there were any of specific responses that they wished to redact. Known alternatively as a member-check (Burnard, Gill, Stewart, Treasure, & Chadwick, 2008) or participant validation (Bryman, 2016; Burnard et al., 2008) this process seeks to corroborate or refute the account provided by the researcher of the interview transcripts and/or the data analysis. Nobody took me up on the offer of having a digital copy of the interview, nor did anyone withdraw any responses. More importantly in terms of data verification, which speaks to the trustworthiness of the study through the notion of credibility (Guba & Lincoln, 1994; Lincoln & Guba, 1985) no participants disagreed with the transcripts. Instead this confirmed that the transcripts reflected an accurate account of "what they aspired to convey" (Simons, 2009, p. 5). This concludes my account of my primary method of data collection. I next discuss the second data collection used, that of non-participant observations.

Method 2: Non-participant observations

Even before I had conducted the literature review and established that there were methodological gaps in the empirical research I was attracted to the possibility of using observations as one of my principal data collection methods. This originates from my work as an SIO, where the observation of educators teaching followed by supportive and constructive feedback on ways for them to improve was a core component of the prevailing school improvement modus operandi. In my experience based on many such encounters I knew that there was a gap between what many educators said they did and actually did in lessons. This phenomenon is not just confined to educators. Robson (2008) notes that all non-observational methods, particularly survey research or interviews introduce the risk of researchers not being aware of a lack of congruence between stated and actual behaviour. Hence, I become increasingly convinced of the importance of using observations in my research. Without an ability to "yield more valid or authentic data than otherwise would be the case with mediated or inferential methods" (Cohen, Manion, & Morrison, 2007, p. 396), I felt that researching educators' teaching practice by relying exclusively on interviews and documents scrutiny would have jeopardised the research's validity. I have previously identified that a major weakness of the majority of empirical studies was that they were potentially exposed to the discrepancy between stated and actual behaviour. Indeed, by failing to incorporate observations I felt that I was in severe danger of replicating the potential weaknesses of the empirical research that I critiqued in Chapter 4.

Bryman (2016) writes that interviews and questionnaires as a singular method of data collection can be problematic in terms of how participants construe meaning, how good their memory is, and what they leave out from answers. Participants may feel threatened by the questions or have issues with the interviewer and may feel obliged or pressured to answer certain questions (these effects are referred to as the social desirability effect, informant bias and participant reactivity). I concluded that the use of observations as another data source used in parallel to the semi-structured interviews already planned could be used to reconcile any specific issues occurring with problems of meaning, omission, and question threat. This enabled me to move beyond perception-based information and to access personal knowledge, to detect things that may have been unconsciously missed out by the participants and to uncover things that the they may not freely talk about. In the sense that they are sensitive to contexts, the observational data thus collected in the natural teaching setting conferred higher ecological validity on the research than otherwise would have been the case (Moyles, 2002). Ecological validity in a qualitative research capacity means that the researcher does not try to manipulate the variables or conditions so that the research takes place in as naturalistic a setting as possible. In this way, the data collected holds true to the tenet of qualitative research which sees data as context-bound within the natural setting (Cohen et al., 2011). For these three motives, I opted to include observational methods in my bespoke suite of data collection methods.

The decision to employ observational techniques was perhaps the simplest part of the process. Previous competing attempts at classifying the populous variants of observation (e.g. Cooper & Schindler, 2001; Flick, 1996; Gold, 1958) hindered my initial selection efforts. I adopted Bryman's (2016) up to date and comprehensive analysis to move forward. Bryman presents seven types; structured observation, systematic observation, participant observation, non-participant observation, unstructured observation, and simple and contrived observation. I concluded that a non-participant, unstructured observation format set in a naturalistic setting was the most likely to elicit the rich, thick, and insightful data that I sought to capture for this qualitative interpretivist study. The selection of an unstructured observation tool reduced my preparation time at the expense of time in the analysis phase. I saw its real advantage as residing in its ability to generate the rich description that is the hallmark of qualitative research. In the observation of teaching I was seeking to establish the actual extent of the use of the operational devices of brain-based education and how they were employed in a real-life teaching situation. My selection of a non-participant design accords with Adler and Adler's (1994) argument that qualitative observational research should be non-interventionist. By this they mean that as the researcher, I should refrain from manipulating the situation or subjects, or pose questions for the subjects nor indeed deliberately create "new provocations" (p. 378).

Conducting an unstructured observation format meant that I went into each observation with no preconceived foci to speak of. I did find the schema of Morrison (1993) and the taxonomy of Cohen et al., (2011) useful as background information, in that I thought myself to be conducting a programme setting and event observation respectively. In the next section I discuss how I operationalised non-participant unstructured observations.

Procedural details

Having obtained permission through the appropriate school channels, the need for a research bargain was not an issue that I had to contend with (Bryman, 2016). To conduct the teaching observation, I followed the principles of non-participant, unstructured observations in the normal setting i.e. the school and classroom of the participants. For the teachers, this meant asking if they were willing to be observed for the purposes of the research project at the time of their interview. The observations lasted only for the length of the lesson which was on average 60 minutes. As already noted, each observation was unstructured in that it did not entail the use of an observation schedule for the recording of teacher behaviours. The reason for this was because I wanted to record in as much detail the participants' behaviour and practices so that I could develop a narrative account of their teaching practices. The verification strategy that I used was that of discussing my observations in a debrief session straight after the observation. These were very brief as usually the teacher was heading straight off to another lesson. These exchanges served to support adjustments to my observation notes so that they also reflected the participant's interpretation of their practice. As the amended observation notes were already in a text format there was no need for me to undertake any further transcription activities.

I was only able to undertake four such observations. This was less than I would have liked. The difficulties arose because only nine of the participants had full-time teaching roles. It was from this cohort that the four observations emanated. The remaining four teachers were unable to provide suitable times for lesson observations in the data collection phase because they had more senior roles within schools with attendant limited teaching responsibilities. That all being said, the four observations did allow me to see a close correspondence between the interview data and practice of the relevant participants. In lieu of the observations that couldn't be arranged, some participants volunteered their lessons plans. I gathered a total of five such lesson plans. When considered with the extensive number of other lesson plans I could review during the documentary scrutiny process, I felt satisfied as a researcher that I had got under the skin of any incongruity between the articulation and practice of behaviours by the participants enough to expose the existence of a such a gap. This discrepancy was an important finding. It is considered more comprehensively later.

Method 3: Document analysis

Maguire et al. (2013) emphasise that "One of the ways in which schools signal their policy priorities and their policy concerns is through the artefacts that they produce (p. 324). I collected 72 such artefacts or documents. These served two purposes, namely to collect further data and to verify information obtained from the interviews and observations. As already suggested, unlike interviews or observations, document data are an unobtrusive form of data collection (Lincoln and Guba, 1985). They constitute any form of data that are not gathered by way of observations or interviews (Merriam, 2002). The advantages of document data are their readily availability at low cost and their text-based nature. These must be offset against their purported disadvantages. Documents can be unrepresentative, selective, and subjective: worse still, they may be of unknown validity and may even be possibly deceptive (Cohen et al., 2011; Finnegan, 1996). Overall however, I felt that their use added to the credibility to the research findings and interpretations.

The documents analysed were lesson plans, school lesson planning templates, lesson observation records, school policy documents and other sundry documents. These 72 documents were for a range of audiences including personal, organisational and public (Scott, 1990). None of these documents were produced for the purposes of the research, rather, they were "simply 'out there' waiting to be assembled and analysed" (Bryman, 2016, p. 546). A summary of the numbers of each of the six different document types collected for scrutiny is provided in Table 6.2. In Table 6.2 I also summarise how I acquired each type of document and present an audience classification based on Scott's typology.

Table 6.2: Summary of documents scrutinised

Name of document (Total number)	How acquired (and number)	Classification
Lesson plans (33)	Combination of: 1. Participants - provided on my request (5) 2. Expert TEEPers - opportunistic but previously circulated around schools so considered to be the in public domain (26) 3. LA/SIO - voluntarily donated by SIO colleagues (2)	Private /personal
Blank school lesson planning templates (12)	Combination of: 1. already in my possession (7) 2. drawing on school or LA contacts (3) 3. downloaded from school website (2)	Organisational /official
School documents (25)	Combination of: 1. Ofsted reports (11) 2. Curriculum policy (2) 3. Teaching and learning policy (5) 4. Other school documents available on the website (7)	Organisational /official
Sundry (2)	Voluntarily donated by LA colleagues: a) TEEP action research report (1) b) Graduate Teacher Programme (GTP) PD PowerPoint (1)	Organisational

All the several types of document were useful to me as I pursued answers to the research questions. The most important of these seemed to be the practitioner's personal lesson plans because they were the next best thing to undertaking an observation of that lesson. The results of an assessment of the relevance of each of the document types is presented in Table 6.3. Collectively, the separate documents provided additional data that provided useful research insights. These insights comprised the following; the current and historical brain-based practices across Westford, the ways in which those practices manifested themselves, whether the reasons for use of brain-based education included organisational expectations/requirements, and additional transition mechanisms of brain-based education within the LA.

Table 6.3: A summary of the content and relevance of each type of document

Document	Typical content	Relevance
Lesson plans	An outline of the lesson including details of techniques, the strategies and resources used to deliver the curriculum content.	Indicates if and how brain-based teaching strategies/ methodologies are used by Westford's practitioners.
School lesson planning templates	The proforma that the school requires all staff to use when producing a lesson plan.	Indicates whether an expectation/requirement to use the operational devices. If yes, how?
Formal observation schedules	Assessment of teachers' classroom performance usually against relevant standards (Ofsted or ITT).	Indicates if and how brain-based teaching strategies/ methodologies were used.
School documents	Report of teaching and learning practise across the school and an assessment of its effectiveness in terms of raising school academic standards.	Could indicate if and how operational devices are being used by Westford's educators.
	Formal exposition of school policy regarding teaching and learning practice.	Indicates whether there is a policy expectation/requirement to use operational devices. If yes, how?
Sundry 1	Action research report on the impact of the use of TEEP in one curriculum area at one school.	Indicates how much educators in one curriculum area were using operational devices. Demonstrates expectations regarding use of operational devices.
Sundry 2	ITT PD PowerPoint.	Indicated propagation and of operational devices transferred by Westford personnel as best practice to new teachers.

This section on methods has documented the three data collection methods I used. I now examine the matter of ethics.

Ethics

Ethics is ubiquitous and as such it permeates all aspects of our lives (Soltis, 1990). Ethics has been defined as a "set of moral principles and rules of conduct" (Morrow & Richards, 1996, p. 90) and elsewhere as:

> to do with how one treats those individuals with whom one interacts and is involved and how the relationships formed may depart from some conception of an ideal. At a common-sense level, caring, fairness, openness and truth seem to be the important values undergirding the relationships and the activity of inquiring (Smith, 1990, p. 260).

Soltis (1990) recognises that as researchers, we deal not with subjects, but with real people who deserve respect as persons and who need researchers to recognise their claims for ethical treatment. Sharing solidarity with these statements, I conceive of myself as a researcher who wishes to assume an ethical stance in relation to the conduct of my research endeavours. I document this stance next by firstly positioning ethics within a philosophical, and secondly, within a procedural framework.

Philosophical stance

Despite Bryman's (2016) observation that the ethical debate has remained stagnant since the 1960s, I consider there is enough evidence to suggest that his claim is wrong. There is a healthy debate in the literature over whether the present axiology of research ethics is appropriate for qualitative research. This concern is situated in the belief that the hegemonistic tradition steeped in the ideals of principalism originates from a predecessor paradigm (positivism) beset by notions of paternalism, manipulation, control, intervention, and that the researcher knows best (Lincoln, 1990; Soltis, 1990). Lincoln clarifies that:

> More so than the constructivist paradigm, logical positivism sets up a cycle wherein the researcher, whether implied or announced, is always the person(s) adjudged to know 'the good'. After, all, in the conventional paradigm, it is the inquirer who seeks funding, who frames and bounds the questions, who designs the overall inquiry strategy (methodology), who makes all the decisions regarding appropriate manipulation and control to finally assert that the study was 'contamination proof' (Lincoln, 1990, p. 281).

It is argued that qualitative research is not the same as quantitative research. In fact, the two traditions are difficult to reconcile. Qualitative methods have at their methodological heart an expansionist epistemology (Lincoln, 1990). The outcomes of qualitative methods in reality are messy and less predictable than quantitative methods, where the researcher can predict ethical issues and then manage them out of the research process (Macfarlane, 2010). As different traditions produce very different products, expected products and conclusions (Smith, 1987) the argument continues, judgments of ethical decisions need to reside within their own tradition. Laws about confidentiality, privacy and anonymity that were framed under positivistic epistemologies and ontologies are judged inadequate and misleading for research involving human participants (Lincoln and Guba, 1985). There are many presenting solutions. Smith (1990) offers six ethical guideposts and Soltis (1990) presents an ethical periodic table of possible concerns to be used to predict possible outcomes when certain situations or events react, thereby guiding the researcher to an ethical solution (Lincoln, 1990). More recently, Macfarlane (2010) harnesses virtue theory to derive a way of connecting research ethics to one's own lived experiences as a researcher. As a working definition, I propose that virtue theory "sees being ethical as not just deducing specific acts from abstract principles but having a type of character with sound judgment to respond correctly to varied complex circumstances" (Grcic, 2013, p. 416).

I have been persuaded of the cogency of the argument above which rejects the principalistic position. To remain in ethical harmony with the qualitative movement I have adopted a stance mid-way between that of particularism (Hammersley, 2009) or situationalism (Fletcher, 1966) and universalism. Particularism deems that moral judgement can only be determined on the basis of a particular set of circumstances rather than following absolute principles. Accordingly, it would seem to be a particularly appropriate overarching ethical stance for those research methods, like those of the qualitative tradition, which do not conform to the normal parameters of predictability and certainty and create pre, post and in-field situations where events can take on a life of their own, transpire or indeed unravel without any forewarning. As I needed to be adaptable, flexible and even spontaneous in the field (see Chapter 5), I needed an ethical framework which allowed this manoeuvrability to further the best interests of the research study.

To qualify this position, I also partially adopted the universalist stance (Bryman, 2012). This meant that I took the view that certain ethical precepts should never be broken and furthermore that deviations from the ethical code of conduct are both morally wrong and damage the fabric and reputation of social research. Such a stance can be most readily detected in the work of Bulmer (1982), Dingwall (1980) and Erikson (1967). I used Macfarlane's (2010) virtue code to bridge these two potentially conflicting positions. Virtue theory "brings responsibility down to the level of each individual researcher and demands and authentic rather than formulaic consideration of day-to-day decisions" through "being a good researcher" rather than "doing good research" (Macfarlane, 2010, p. 26). This is achieved by living the virtues that are deemed important– courage (or bravery), respectfulness, resoluteness (or perseverance), sincerity (or honesty), humility (or modesty), and reflexivity (Kiley & Mullins, 2005; Macfarlane, 2009; Pring, 2001). This concludes my presentation of my ethical stance. I next explain how I transacted virtue theory during my research.

Procedural details

Macfarlane (2010) differentiates between procedural ethics and ethics in practice. Procedural ethics are concerned with satisfying the research ethics process whereas ethics in practice deal with the real challenges posed in the field (Guillemin & Gillam, 2004; Palaiologou, 2012). Denzin and Lincoln (2011) can be credited with providing the most comprehensive and current coverage of the discourse on procedural ethical matters. In broad agreement with the field, they crystallise the key ethical issues as informed consent, deception, privacy, and confidentiality but go beyond, and annex the notion of accuracy – embodying researcher fraud, misrepresentation, and misconduct - as an additional component.

As my data collection phase took place whilst I was enrolled as a PhD student at another English University, I was therefore required to adhere to the *Research Principles and Research Misconduct Code of Practice* within their Faculty of Education's Handbook. After a transfer, I was subject to the equivalent regulations of UCL's Institute of Education. I demonstrated full compliance with the both sets of ethical regulations. I also ensured that all data collection and reporting conformed with the presiding legal legislation including specifically the Data Protection Act 1998. I document below the specific strategies that I followed to address the complex ethical issues concerning access, consent, privacy, and confidentiality (Patton, 2002). I did not engage in practices that could be considered as being deceptive and amounting to betrayal during conduct of this research project and hence these are not discussed in detail in this section.

Obtaining Ethical Approval

The Faculty of Education at the original host University required all postgraduate research to have obtained ethical approval in advance of the commencement of the data collection phase. The proposal was submitted to the Faculty of Education Ethics Committee in November 2012 and full approval was granted shortly thereafter. The key issues detailed in the ethical proposal concerned the proceeds by which informed consent was obtained, and how data was gathered and stored (see Appendix 6.3).

Consent

After Morrow and Richards (1996), consent can be viewed in three ways - informed consent, assent, and dissent. Informed consent is thought to be the one of the most important principles for the protection of human subjects (Smith, 1990). In line with the stance of Universalism, I adopted informed consent as the most appropriate type of consent for this research study because as the British Sociological Association Statement says:

> As far as possible participation in sociological research should be based on the freely given informed consent of those studied. This implies a responsibility on the sociologist to explain in appropriate detail, and in terms meaningful to participants, what the research is about, who is undertaking and financing it, why it is being undertaken, and how it is to be disseminated and used (British Sociological Association, 2002, p. 3).

I pro-actively ensured that the participants decided to participate in research voluntarily and in full cognisance of the aims of the project, the research methods and the likely audience of the final report. According to the guidelines of the Social Research Association, informed consent means informing the participant at the time they are approached that they have the option to choose to participate without coercion. Moreover, informed consent means making the participant aware that they can withdraw at any time without fear of consequence, thus:

> Involuntary inquiries, subjects should not be under the impression that they are required to participate. They should be aware of their entitlement to refuse at any stage for whatever reason and to withdraw data supplied. Information that would likely to affect a subject's willingness to participate should not be deliberately withheld since this would remove from the subjects an important means of protecting their own interests (Social Research Association, 2003, p. 27).

However, I was aware that making a prospective participant sign consent form can make them suspicious (Grayson & Myles, 2005) as I do myself feel when sometimes asked to take part in research. I thought that the nature of my topic, although totally fascinating and of paramount importance to me, to be in fact quite innocuous, rather than sensitive and controversial. I worried that by overtly and expressly asking for a signature I might have signalled to the contrary. I feared that this might lead to otherwise unnecessary participant withdrawals. After some reflection on this matter I submitted my ethics proposal on the following premise. After full disclosure to the participants of their rights on informed consent, privacy and confidentially both before in writing by email and then again verbally at the beginning of the interview, I would not be expressly asking for a signed consent form. I indicated that by their act of taking part in the interview, that I deemed consent to have been given by the participants. The ethics committee and indeed all my participants were happy to accept this as I obtained full ethical approval (Appendix 6.2) and no participants withdrew.

Privacy and Confidentiality

Yu (2008) sees the customary act of offering participant's confidentiality as a throwback to the ethical requirements of medical investigations, where participants were invariably viewed as being vulnerable. Yu contests that this is not always the case in social science. Yu cites examples of participants who are much higher status than the interviewer, or situations where participants want to have their stories heard and reported. Kimmel (1988) notes that some participants will not engage in the research when they feel that the researcher's assurance on confidentiality is weak, vague, or not believed to be genuine. I advised the participants at the start of the interview that they, along with myself and my supervisors, would be the only people to hear the recordings or see their transcripts.

I utilised the relevant techniques listed by Frankfort-Nachmias and Nachmias (1992) to allow public access to data without confidentiality being breached. This included informing the participants that I would delete all personal identifiers and that crude report categories would be used for presenting demographic information, using labels like 'LA' or 'School' with numbers allocated to each participant (e.g. School 1, etc.) Despite this, I remained aware of Macfarlane's (2010) caution, that in some situations, for example, single institution case studies, the promise of confidentiality "can be no more than a fig-leaf" (p. 21). This is especially so when conducting qualitative research that, by its very nature, is focused on obtaining deep understandings of the individual participants' perceptions. The consequence of this usually means that the presentation of verbatim quotes occurs frequently during reporting. Privacy, which is deemed to be more than simple confidentiality (Cohen et al., 2011), is the right of the participant not take part in the research, not to answer questions, not to be interviewed, not to answer emails or answer telephone calls from the researcher. Substantively speaking, this aspect of ethical behaviour has been addressed under the auspices of consent.

To conclude, as Macfarlane (2010, p. 26) counsels, "Ethics is like jazz. It is more than simply following the notes on the page. It demands improvisation and an ability to be an interpreter of moods and situations". I consider that by using virtue theory as a navigational compass and by having a foot in each camp I could take the best from each ethical stance to work towards becoming a 'good' qualitative researcher. Virtue theory or virtue ethics "is an approach in normative ethics which emphasises moral character.

Axiological vignette No.1.
Values: caring, fairness, openness and truthfulness

I have previously referred to Soltis (1990) and Smith (1990) who respectively promote the ideas of dealing with participants not as 'subjects' and in a caring, fair, open and truthful way. I explained to each participant that I anticipated that I would be using verbatim quotes from them in my thesis, but I gave them the assurance that I would use pseudonyms so that their identity would remain protected from the readership. I decide to use pseudonyms because I saw the participants as individuals rather than as subjects and because I wanted the findings and analysis section of the thesis to read as a humanistic narrative rather a detached and clinical report.

Furthermore, I gave each participant a chance to review their transcript and offered them a copy of their recording although not all participants took me up on this offer. On a practical level, this enabled them to give feedback on any transcription errors, provide additional clarification on certain matters. Perhaps more importantly, they could request that parts or all the transcript not be quoted verbatim, attributed, or fully withdraw.

Example 6.2: Axiological vignette No.3

It contrasts with an approach which emphasizes duties or rules (deontology) or one which emphasizes the consequences of actions (utilitarianism)" (Hursthouse, 1999, p. 1). As I have intended to demonstrate in my research conduct:

> the researcher must rely on their own personal values and virtues in order to handle ethical issues in the field. This is about practical wisdom … Getting better at handling ethical issues only comes with practice, experience and learning from the good (and bad) example of others; learning, in the process, whom to respect and whom to ignore (Macfarlane, 2010, p. 25).

This section on ethics has documented my ethical stance, firstly from a theoretical perspective and then from an operational point of view. A summary of this chapter follows.

Summary

This chapter has covered the three data collection methods that I used. In the second part of the chapter I explored the matter of ethics. In the next chapter I firstly present the theoretical basis of the qualitative data analysis technique of thematic analysis. I then proceed to I explain how I utilised thematic analysis to analyse the data thus collected.

Chapter 7: **Data Analysis Techniques**

The purpose of this qualitative inquiry was to explore the response of Westford's secondary practitioners' PD contact with contested neuroscience in terms of their knowledge and practice. The data collected using the methods outlined in Chapter 6 resulted in a text-based body of data. The analysis method employed to make sense of these data to formulate a response to the research question was that of thematic analysis. At this point for conceptual clarity, I outline the different meanings that I ascribe to analysis and interpretation as these have a bearing on how the final reporting of the analysis is arranged. I adopt Simons' understanding of both concepts which are:

> Analysis… mean[s] those procedures – like coding, categorizing, concept mapping, theme generation – which enable you to organize and make sense of the data in order to produce findings and an overall understanding (or theory) of the case … Interpretation… mean[s] the understanding and insight you derive from a more holistic, intuitive grasp of the data and the insights they reveal. This may take into account understandings gained from formal analysis, but more emphasis is placed on retaining the holistic nature of the data through intuitive and … processes (2009, p. 117).

On this basis and for other reasons set out later, I have located the data analysis in this chapter whilst the results of the interpretation of that analysis is given in Chapter 9.

Chapter overview

The chapter commences with a theoretically orientated discussion about qualitative data analysis. Then the data analysis technique of thematic analysis attributable to Braun and Clarke (2006) is explained and positioned within the qualitative data analysis field previously established. Next, in the substantive part of the chapter all six stages of Braun and Clark's variant of thematic analysis are explored and grounded within the arising data corpus using exemplifications where relevant.

Qualitative data analysis

Data analysis, in a research setting, is essentially a postmodern concept in that it is concerned with deconstructing findings (Bloomberg and Volpe, 2012). Arguably, although they blur analysis and interpretation, one of the simplest definitions of qualitative data analysis is from LeCompte and Schensul (1999) who see it as reducing the research data to a story and its subsequent interpretation. The individual components of any research database can typically include interview transcripts, field notes, or observations or indeed the "more creative use of such sources as recorded observations (both video and participatory), focus groups, texts and documents, multi-media or public domain sources, policy manuals, photographs, and lay autobiographical accounts" (Thorne, 2000, p. 68). Conjointly, they provide a descriptive account of the study, but they do not provide explanations (Pope, Ziebland, & Mays, 2000). It is the researcher who must make sense of the data that have been collected by exploring and interpreting them (Burnard et al., 2008) because as Denzin observes "Nothing speaks for itself" (1994, p. 500). The attractive nuisance of a qualitative data corpus (Miles, 1979) must therefore, be navigated to arrive at the meanings, explanations and interpretations that characterise qualitative research findings.

There are multiple approaches extant to achieve this goal (Kawulich, 2004; Kawulich & Holland, 2012). I accept Kauwulich's assessment that the sheer choice of approaches available from which a neophyte researcher must choose is overwhelming. Ritchie et al. (2013) suggest the following methods; Ethnographic Accounts, Life History, Narrative Analysis, Content Analysis, Conversation Analysis, Discourse Analysis, Analytic Induction, Grounded Theory, Interpretive Phenomenological Analysis and Thematic Analysis. Further proffered methods include Constant Comparative analysis (e.g. Glaser & Strauss, 1967; Merriam, 1998), Cross-Cultural Analysis (e.g. Bernard, 2000) and Framework Analysis (e.g. Pope et al., 2000). Radcliff (n.d.) gives details on 15 qualitative data analysis methods. In sum, these qualitative approaches are incredibly multifarious, complex and display significant levels of methodological granularity (Holloway & Todres, 2003).

I found the guidance available to support my decision-making from the array of possibilities limited. I found only limited practical guidance on the operationalisation of these data analysis methods. I am not the only researcher faced with a qualitative analysis task who has struggled with such issues (e.g. Burnard et al., 2008). This situation arises from the widespread agreement in the literature that "There is no one single or correct way to analyse and present qualitative data; how one does it should abide by the issue of *fitness for purpose* [original emphasis]" (Cohen et al., 2011, p. 537). Exercising fitness for purpose in this sense required me to consider several key issues in order that congruence between the analysis and methodology is attained (King, 1995; van Manen, 1998). Indeed, "Each tradition is sensitive to particular analytic methods and strategies, as such demanding that the researcher think about data analysis" (Bloomberg and Volpe, 2012, p. 173). These issues comprise what the purpose of the data analysis is, what the nature of the dataset is, and what kind of research inquiry is being conducted. On the second question of the nature of the database, I employed the selection guidance offered by Ritchie et al. (2013). They proposed that researchers can select whether a substantive or structural/constructionist approach is better suited to the type of their dataset. They differentiate a substantive approach as being one which is concerned with capturing and interpreting the meanings in the data, with an overarching emphasis on what the text *says.* Conversely, Ritchie et al. (2013) posit that a structural/constructionist approach to data analysis rests on establishing what the text *does*. This typology frames thematic analysis and grounded theory as substantive approaches. Narrative analysis and conversation analysis are held to be examples of structural/constructionist approaches.

Ultimately, two factors facilitated my conclusion that the technique of thematic analysis was a suitable analytical vehicle for ensuring methodological commensurability. These factors were the notion that ultimately a researcher's preferences and experiences will have a bearing on what method is chosen (Schutt 2012, p. 333) and the desire to be faithful to the above guidance. I next outline the key features of thematic analysis as a qualitative data analysis method from a conceptual and philosophical perspective. I then explain why I believe that by using Braun and Clarke's variant of thematic analysis, I ensured that Cohen, Manion and Morrison's notion of fitness of purpose was properly addressed in my study.

Thematic analysis

Thematic analysis is a foundational analytic method that involves identifying patterns and themes in qualitative data (Braun & Clarke, 2006; Kawulich & Holland, 2012). The search for themes are those that are considered important to providing a description of the phenomenon under study (Daly, Kellehear, & Gliksman, 1997). It goes beyond word or phrase counting to analyses involving "identifying and describing both implicit and explicit ideas" (Guest et al., 2012, p. 10). It is held to be "a rather diffuse approach with few generally agreed principles for defining core themes in the data." (Bryman, 2016, p.697). Nonetheless, it has become an extremely popular method across many academic disciplines, not just the social sciences or indeed education (Fugard & Potts, 2015, p. 669). Indeed, it is believed to be *the* most widely used approach (Guest et al, 2012).

Merton was the first to use thematic analysis as a named method in 1975. Much of the subsequent popularity is to do with Braun and Clarke's seminal 2006 paper *Using thematic analysis in psychology,* where they gave it "brand recognition" (Braun & Clarke, 2013, p. 120). In addition to Braun and Clarke's version, there are several other variants extant under the portmanteau of thematic analysis. The most well-known of these are those authored by Attride-Stirling (2001), Guest et al. (2012), Joffe and Yardley (2004) and Boyatzis (1998). These variations on the 'core' method of thematic analysis delimit themselves in terms of either presentational or philosophical emphasis. Attride – Stirling (2001) advocates constructing "web-like illustrations (networks) that summarise the main themes constituting a piece of text" (p. 386) to accompany the theme narrative. Thematic analysis courtesy of Guest et al. (2012) (who term it applied thematic analysis) and Joffe and Yardley's (2004) version are more phenomenologically nuanced than the other versions. Conversely, Boyatzis foregrounds a "data-driven inductive approach" (Fereday & Muir-Cochrane, 2006, p. 6) in his version of thematic analysis.

Pattern-seeking in data is a technique applied in other qualitative analytical approaches, for example, Interpretative Phenomenological Analysis discourse analysis, and grounded theory. Thematic analysis however retains a dissimilarity because it does not prescribe data collection methods (Braun and Clarke, 2013). Thematic analysis is further marked out as distinctive as it is atheoretical (Black, 2015). Braun and Clarke (2006) argue that thematic analysis is a technique divested of theoretical positioning, unlike other approaches which all exhibit particular positions on epistemology and ontology. Thematic analysis is compatible with essentialist/realist paradigms, which report the experiences, meanings and the reality of participants, and also constructionism, which examines the ways in which events, realities, meanings, experiences are the effects of a range of discourses operating within society. They further counsel that:

> It can also be a 'contextualist' method, sitting between the two poles of essentialism and constructionism, and characterised by theories such as critical realism (e.g. Willig, 1999), which acknowledge the ways individuals make meaning of their experience, and, in turn, the ways the broader social context impinges on those meanings, while retaining focus on the material and other limits of 'reality'. Therefore, thematic analysis can be a method which works both to reflect reality, and to unpick or unravel the surface of 'reality' (p. 9).

Since my theoretical stance is that of subtle realism and transactional subjectivism within a paradigm of interpretivism (see Chapter 5), I concluded that the use of thematic analysis would provide me with theoretical congruency.

Practically, thematic analysis is also considered to be a highly flexible method (Braun and Clarke, 2006). It can be used to satisfy a wide range of analytic purposes and different types of research question. It can produce conceptually-informed interpretations of data and can be applied to most types of primary and secondary qualitative data. Moreover, thematic analysis works equally well large or small data sets and as such it affords researchers much analytical traction. It is for all these reasons, coupled with its relatively straightforward implementation profile (Clarke and Braun, 2013) that I finally selected thematic analysis as my analytical method. Of the variants of thematic analysis available, I opted for Braun and Clarke's version since they are the authors most closely associated with popularising the methodology. Additionally, because of the interest in Braun and Clarke's work, there was considerably more guidance material available for me to consult on how to operationalise their implementation procedures. As a novice researcher I valued the support that this level of guidance offered for what proved to be a challenging task.

Operationalising thematic analysis

Braun and Clarke (2006, 2013) posit that the transformation of the data corpus into meaningful themes involves six, distinct phases of implementation. I have reported the phases in Figure 7.1. For the first three phases, Braun and Clarke's procedures overlapped considerably with other guidance on both generic qualitative analysis (e.g. Bryman, 2016) and the other variants of thematic analysis (e.g. Attride-Stirling, 2001). In undertaking the first three stages I synthesised practical advice from many sources but for the final three stages, I only used Braun and Clarke (2006, 2013). The next section reports my progress through the each of the stages.

Phase One: Familiarisation with data

Early immersion in data is paramount to the success of the analysis endeavour and this can begin with the act of transcription itself (Braun and Clarke, 2006, 2013; Hepburn & Bolden, 2017). Undertaking the transcription is aiding the immersion process because it is an opportunity that "usually generates emergent insights" (Patton, 2002, p. 441).

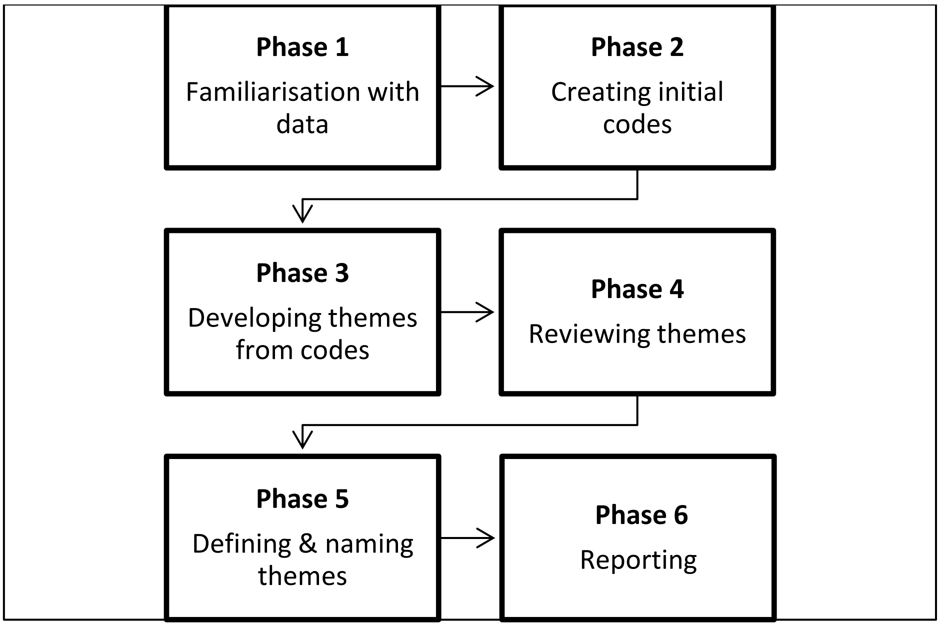


Figure 7.1: The six phases of thematic analysis (Braun and Clarke, 2007)

I replicated these familiarity activities with the entire text-based data corpus to continue the immersion process. During this process, my thinking was directed by the advice of Ritchie et al. (2014) that the researcher asks themselves "What are people saying that is relevant to the research question?" (p. 282). In the memos and notes that I generated I began identifying ideas for later coding and this had the effect of grounding and supporting the subsequent labels in the data (Ritchie et al., 2014).

Silverman (2011) suggests that an initial detailed analysis of a small section of data "will give you a good initial grasp of the phenomena with which you are concerned" (p. 62). Drawing on aspects of this advice to conduct 'intensive analysis', I also adopted a more proactive stance still, in that I used a template analysis approach to arrange the entire dataset by interview question so that I could get to know my more data thoroughly. Template analysis is a method which has been popularised across many disciplines by Nigel King's advocacy (Waring & Wainright, 2008). It is epistemologically flexible and "a useful way of structuring qualitative data to make the complexities of the analytic process more manageable" (Cassell, 2011, p. 222). Quite simply, it is an organisational technique that enables researchers to place some order on their data from the outset of the analysis phase. It helped alleviate some of my anxiety that was caused by the sheer volume of data produced in my qualitative study (Cassell, Buering, Symon, Johnson, & Bishop, 2005). The key component of template analysis is the creation of a template into which the data can be categorised. The structure of the template is derived a priori from the interview questions and/or the research questions, and/or an analysis of a subset of the data (Silverman, 2011). It is then adapted to reflect the data itself, in a more inductive way as the coding template is finessed (King & Brooks, 2012). The use of template analysis within a wider thematic analysis approach is considered acceptable (Brooks, McCluskey, Turley, & King, 2015, p. 4) since it is acknowledged there are multiple ways of doing thematic analysis (Braun & Clarke, 2006; King & Horrocks, 2010). Unlike fully-fledged template analysis which then goes on to code the data that has been arranged by the initial template structure, in my case, interview questions, I ceased the template approach after the arranging stage. I only used the template approach to facilitate a deep immersion in my data rather than to initiate the initial coding process, which is what I discuss next.

Phase Two: Creating initial codes

The second phase of thematic analysis requires the generation of codes. Codes symbolically, summatively and saliently assign an idea and/or evocative attribute to a segment of data. They consist of pithy labels, most often words or short phrases, identifying what is of interest in the data in relation to the research question (Ryan & Bernard, 1998; Saldaña, 2013). Saldaña (2013) issues further guidance that:

> A code is a researcher-generated construct that symbolises and thus attributes interpreted meaning to each individual datum for later purposes of pattern detection, categorisation, theory building, and other analytic processes. Just as a title represents and captures a book, film, or poem's primary content and essence, so does a code represent and capture a datum's primary content and essence (p. 4).

The procedure of coding is part of analysis, specifically belonging to the phase of data reduction, which involves reducing and organising the database (Miles & Huberman, 1994). Glaser and Laudel (2013) explain that "While it is central to qualitative research to create this complexity in the first place, it is nevertheless essential to reduce it in order to arrive at generalized explanations" (n. p.). Data reduction thus became important to me because in order to arrive at explanations of social situations and processes, I needed to systematically reduce the complexity of the information that I generated during the qualitative data collection.

Data reduction is consequently considered to be the critical link between data collection and deriving an explanation of meaning (Charmaz, 2001). The actual mechanics of coding can be done using computer software or manually. What remains common among both approaches is the application of the researcher's judgment in identifying and naming “the most basic segment, or element, of the raw data or information that can be assessed in a meaningful way regarding the phenomenon” (Boyatzis, 1998, p. 63). Although Male (2015) reiterates this first concern, he points out why CAQDAS (computer aided qualitative data analysis software) is popular with researchers, who like me, are keen to harness the power and speed of technology to facilitate “human analytic reflection” (Saldaña, 2013, p. 28):

> The key message to remember, however, is that no software program will analyse your data for you – the definition of codes is still your responsibility. What the software will do is take away some of the laborious tasks from the analysis of qualitative research in much the same way as a calculator made arithmetic so much easier (Male, 2015, p. 186).

Because of the advantages in coping with the data-overload and retrieval issues associated with large qualitative datasets (Kelle, 1995) and “the speed of organised and systematic data collation … and its ability subsequently to process data rapidly” (Cohen et al., 2011, p. 543), I used the proprietary *ATLAS.ti* software to facilitate my coding phase. With all the data items input into *ATLAS.ti*, I carefully read the data, line by line to locate meaningful segments of text. These analytical units of meaning were given a code. There are two types of “First Cycle” coding (Saldaña 2013, p. 58); emergent coding or a priori coding. A priori coding adopts a deductive approach whereas emergent coding takes an inductive approach and the researcher codes initially based on what presents itself in the data. The origins of emergent coding are to be found in grounded theory (Male, 2015). Braun and Clarke (2013) do not advocate the use of a priori codes. Emergent coding can take a multitude of forms including for example, open (or initial), in-vivo, structural, descriptive or attribute, indeed, Saldaña (2013) offers 26 types arranged under eight headings. I used open/initial coding as originally ‘named and claimed’ by Charmaz (2006) although attenuated by Braun and Clarke’s interpretation of it thus:

> Our approach to coding is flexible and organic, and coding should evolve throughout the coding process – to some extent our approach to coding is similar to initial coding in grounded theory (Charmaz, 2006). We understand coding as an active and reflexive process that inevitably and inescapably bears the mark of the researcher(s) (Braun & Clarke, n.d., para. 36).

By the end of this coding phase I had accumulated 276 codes in *ATLAS.ti*. I had clearly, but inadvertently, fallen into the trap of “If it moves, code it” (Richards & Morse, 2007, p. 146).

Phase Three: Developing themes from codes

Auerbach and Silverstein (2003) liken the process of coding to that of moving up a staircase. The initial codes at the bottom are at a lower level of understanding of the phenomenon. The themes at the top are at much higher order. I thus envisaged myself progressing upwards but not yet at the top of the staircase. Using the 276 codes already generated , my next actions were focused on seeking out common elements amongst them and grouping them together to produce 'affinity groups'. Braun and Clarke (2006) call these affinity groups potential or candidate subthemes and themes. A theme is "an outcome of coding, categorization or analytic reflection" (Saldaña, 2009, p. 14) whereas Braun and Clarke posit that a theme "captures something important about the data in relation to the research question and represents some level of patterned response or meaning within the data set." (2006, p. 10). Latterly, Braun and Clarke (n.d.) contend that "A theme tends to describe the different facets of that singular idea, demonstrating the theme's patterning in the dataset" (para. 1). A subtheme resides within a theme, sharing the same central organising concept as the theme, but instead homes in on one prominent aspect. In the context of the second definition, a subtheme frames an individual facet of a singular idea. Saldana (2013) explains what happened to my codes as I constructed candidate subthemes and themes from the original code list:

> As you code and recode … your codes and categories become more refined … and more conceptual and abstract. Some of your First Cycle codes may be later subsumed by other codes, relabelled or dropped altogether. As you progress toward Second Cycle coding there may be some arrangement and reclassification of coded data into different and even new categories (p. 11).

Sub-themes, or themes-within-themes, provide structure to particularly large and complex themes and demonstrate the hierarchy of meaning within the data (Braun & Clarke, 2006, p. 22). The memos created during this phase focused on what was meant by the codes, candidate subthemes and themes (Bryman, 2016, p. 588) as well as my, "coding processes and code choices; how the process of inquiry is taking shape; and the emergent patterns, categories and subcategories, themes and concepts in your data – all possibly leading toward theory" (Saldana, 2013, p. 41). Example 7.1 provides an example of an early and unrefined memo from this phase where I explored why practitioners appeared to be attracted to trying out new teaching strategies.

The ways participants react to new teaching strategies (November 2015)

There seems to be repeated talk from participants on the topic that they are predisposed, almost obligated to try out new pedagogies that purport to offer "solutions". To understand how participant's view and thus react to new pedagogies, there is more thinking to be done on what their expectations and needs are in regard to pedagogy, i.e. what are the solutions that they are looking for new pedagogies to provide?! Are these the same for all participants or are they based on personal, individual wants and needs? Some participant's reactions to new pedagogies also seem suggest that they've "seen it all before "(Audrey) and that they are susceptible to "bandwagons" (Grace) and "things of the moment" (Hannah), yet equally, they appear to be prepared to override these worries because they need "things that work!" Does the desire for answers and solutions outrank the negative consequences of being duped by nonsense theory or indeed the pedagogy not working? Ultimately, is this because they are looking for the golden pedagogical nugget or magic learning bullet – the thing that will finally turn them into great teachers?

Example 7.1: An early analytic memo on participants' proclivity to try out new teaching strategies

By the end of this phase, I had a "collection of candidate themes, and sub-themes, and all the extracts of data that have been coded in relation to them" (Braun & Clarke, 2006, p. 20) ready for the next coding step. Phase Four involved further refining of the candidate themes and this process is detailed next.

Phase Four: Reviewing themes

As I have already indicated, from this point forward I only adopted Braun and Clarke's guidance on performing thematic coding. During this phase, I worked to finalise the candidate themes by exercising 'quality control' so that the themes were telling a story that "rings true" (Braun & Clarke, 2013, p. 233). This was done through a process of judging the candidate themes against two criteria firstly at the lowest level of coding and then repeating the same process at the higher levels of coding. For the former, I judged all the candidate themes on two parameters. These were their level of internal homogeneity (all the data within a theme should be congruent) and their level of external heterogeneity (there should be no overlapping of meaning across themes) (Patton, 1990). Where necessary I adjusted the candidate themes where necessary to obtain full compliance with these criteria. Eventually, I arrived at the situation where the candidate themes "adequately capture the contours of the coded data" (Braun & Clarke, 2013, p. 21) and thereby created a candidate "thematic map" (Braun & Clarke, 2013, p. 21). At this point in the review process I had "a fairly good idea of what [my] different themes are, how they fit together, and the overall story they tell about the data" (Braun & Clarke, 2013, p. 21). The prospective thematic map itself was reviewed for its internal homogeneity and external heterogeneity. This review adopted a holistic approach and encompassed the entire dataset. I looked at the lowest level of the data for the candidate themes and at the highest level of the data for the candidate thematic map. Where needed, I made minor iterations to the candidate themes and candidate map. I concluded that I had finally arrived at a set of themes and a map that worked i.e., fitted the data well (Braun & Clarke, 2013).

Phase Five: Defining and naming themes

Phase Five was predominantly concerned with 'defining and refining' or analysing the finalised themes from Phase Four, which meant naming each theme and producing a detailed written summary of it (Braun & Clarke, 2006, p. 22). As I was conducting thematic analysis á la Braun and Clarke I principally drew on their advice to support my thinking during this phase. I repeatedly asked myself "'What story does this theme tell?' and 'How does this theme fit into the overall story about the data?'" as I attempted to identify the essence of each theme (2013, p. 121). In addition to Braun and Clarke's guidance I also found Ryan and Bernard's (2003) suggestion that the essence of a theme can also be thought of as a central organising concept very helpful when working with the themes:

> It is an idea or concept that captures and summarises the core point of a coherent and meaningful pattern in the data. If you can identify the central organising concept of a theme, you can capture the core of what your theme is about. If you cannot do this, your theme may lack coherence (Ryan & Bernard, 2003, p. 87).

I implemented the procedural advice from Braun and Clarke for this stage. This was to first organise the collated data extracts for the themes (produced in Phase Three and then reviewed in light of Phase Four) into a coherent and internally consistent account, with an accompanying narrative, without any deviation. Secondly, I constructed a detailed analysis for each theme. This process also involved the identification of the final sub-themes for each theme. At this point, I could meet Braun and Clarke's challenge that you can describe the scope and content of each theme in a couple of sentences. I was "able to clearly define what [my] themes are, and what they are not" (2006, p. 22) and was ready to select concise, punchy and informative names for the themes (2013).

Names should indicate both the essence of, and your analytic take on the data. The best theme names are those that are evocative, catchy, concise, and informative (Braun & Clarke, 2013). The code *Darwinian pedagogy* came out of the very first coding exercise in Phase One. Here it occurred to me that the operational devices of brain-based education were being adapted by practitioners in rather creative ways, rather than being implemented as intended. To me, the adaptive process imposed on the operational devices shared some affinity with Darwin's Theory of Evolution in that the practitioners seemed to be purposefully mutating (adapting) the operational devices to elicit a functional advantage in terms of teaching. Gradually, I began to shape the candidate and then later, the final themes from the data. At this point like Braun and Clarke (2013, p. 225) I do not subscribe to the idea that themes 'emerge' from the data. Rather they are constructed by me, and even then, are a particular interpretation of the data and this is consistent with my subtle realism stance. The possibility of naming all the themes around The Theory of Evolution seemed like an interesting and creative idea to pursue and moreover seemed to be an analogy that could be made to do powerful explanatory work, however not all the final themes could be named under this topic. For the three that didn't totally fit, I tried to remain as close to the data using an in-vivo name for the theme *Drivers not mechanics* and took inspiration from my own first degree calling one theme *Pedagogical engineers* to capture the fact that practitioners are pragmatic problem –solvers working in complex environments to demanding briefs. For the third theme, I took inspiration from a Radio 4 programme that I had listened to, which explained that 'gothic' was originally used as a pejorative term to describe the rude, pervasive and usurping medieval architecture of the Middle Ages. To me, the term gothic seemed to be a way to describe brain-based education and its operational devices. Table 7.1 reports indicatively on the outcomes of Phase Five. In Chapter 8 these themes are exemplified in relation to the data findings.

Table 7.1: A summary of what each theme is about

Theme	**Theme Rationale**
Theme One. Drivers not mechanics	**Practitioner's knowledge**. This theme is about the findings that show how brain-based education impacted on the knowledge of practitioners, and how neuroscience research, putative and otherwise, had a negligible impact on their decision-making in relation to their use of brain-based education.

Theme	Theme Rationale
Theme Two. Memes, mechanisms, messages and mayflies	**Acquisition of knowledge.** This theme is about practitioners' exposures to and the transmission mechanisms and message - system of brain-based education. The limited lifespan of brain-based education is also a finding discussed in this theme.
Theme Three. The persistent allure of gothic pedagogy[4]	**The appeal of brain-based education.** This theme is about why practitioners found brain-based education and its operational devices appealing and why as effective educators they were impelled to constantly search for metaphorical Holy Grail of teaching, even if it meant that they were then at risk of adopting putative unscientific teaching initiatives.
Theme Four. Darwinian pedagogy	**Use of brain-based education.** This theme harnesses Darwin's Theory of Evolution to illustrate how many of the operational devices were purposefully adapted to effect, often multiple, alternative functions that went significantly beyond their original design intentions in order to extract optimal teaching advantage from them.
Theme Five. Pedagogical engineers	**Reasons for using brain-based education.** This theme examines the wider factors contributing to practitioners' adoption of brain-based education's operational devices. Since it draws to together critical arguments from the earlier themes hence it can be thought of as a summary theme.

Braun and Clarke remind us that unlike quantitative research, the production of the report is not a separate activity performed once the analysis is concluded. Rather, writing and analysis are an entwined and combined process, which encapsulates both the "informal writing of notes and memos to the more formal processes of analysis and report writing" (Braun & Clarke, 2012, p. 69). They also advise that in terms of report writing, phases five and six are hard to separate and are often blurred together. With this caveat in mind, I discuss the final analysis phase next.

[4] For the remainder of the thesis, I use the word *pedagogy* in lieu of the phrase *teaching (and learning) approaches.*

Phase Six: Reporting

The last stage of thematic analysis, according to Braun and Clarke (2006, p.23), concerns writing the complicated story of your data to convince the reader of the merit and validity of your analysis. The inclusion of vivid data extracts which capture the essence of the point you are demonstrating are perhaps the most essential aspect of the writing up process in thematic analysis for, "Your write up must provide sufficient evidence of the themes within the data – i.e., enough data extracts to demonstrate the prevalence of the theme" (Braun & Clarke, 2006, p. 23). Simon cautions us that:

> Simply presenting quotations from interviews or observations without any thematic structure, analysis or interpretation is unlikely to convey the meaning of the case. Even in a qualitative inquiry where the intent is to portray the verisimilitude of the setting or engage the reader vicariously with participants' experience, through using interview excerpts and observations, you need to select data that will tell an eventual story (Simons, 2009, p. 118).

Rather, writing-up involves interlacing the analytic narrative and striking data extracts to tell the reader a coherent and persuasive story about the data and contextualising it in relation to existing literature (Braun & Clarke, 2013).

There are two methods that can be used when writing up the findings of qualitative research (Burnard, 2004). One option is that the key findings under each main theme are reported in one separate chapter. Appropriate verbatim quotes are presented to illustrate the findings. This chapter would be accompanied by a linking, separate discussion chapter in which the findings are discussed in relation to existing research, as happens quantitative studies. The alternative option sees the discussions blended into the findings chapter. Consonant with my previous clarification of the difference between analysis and interpretation, I have opted for the former strategy. I believe that a separate presentation will enable me to both present a richer description of my findings and a better communicated "significance to what was found, making sense of findings, considering of different meanings and offering potential explanations and conclusions." (Bloomberg and Volpe, 2012, p. 177). This approach will be also in keeping with Braun and Clarke's guidance to the use data extracts to support the story of the research. This strategy will hopefully support a better reading experience since Patton (2001) explains that "An interesting and readable report provides sufficient description to allow the reader to understand the basis for an interpretation, and sufficient interpretation to allow the reader to appreciate the description" (p. 253). Accordingly, there is only one analysis chapter presented – Chapter 8.

Conclusion

Unlike quantitative data analysis there are:

> few agreed-on canons for qualitative analysis in the sense of shared ground rules. There are no formulas for determining the significance of findings or for interpreting them, and there are no ways of perfectly replicating a researcher's analytical thinking (Bloomberg and Volpe, 2012, p. 172).

My journey through the analytic process has not been straightforward as I initially imaged it to be. I would liken it to more of a heuristic endeavour, coupled with iterative twists and turns, and accompanied by much reflection and memo writing. I have documented how I approached data analysis within Braun and Clarke's (2006) version of thematic analysis to arrive at the five finalised themes. I have provided the broader theoretical context of data analysis in qualitative research and I have set out my key analytic decisions within this discussion. In the following chapter I report on the outcomes of the analysis techniques described in this chapter.

Chapter 8: **Data Analysis Reporting**

The purpose of this qualitative interpretative inquiry which was set within an LA which had given PD on the brain-based methodology of Accelerated Learning to its secondary teachers, was to explore how secondary school practitioners responded in terms of their practice and knowledge. This chapter presents the key findings obtained from my analysis of 15 in-depth semi-structured interviews, four non-participant observations and the scrutiny of 72 documents. I have stayed faithful to the notion that 'thick description' (Denzin, 2001) is a normative and necessary delineator of qualitative research. Consequently, I have made extensive use of the participant's own words to enable readers to gain an enhanced understanding of the complexity and richness of the world of the participants and their lived experiences therein and thereof. Moreover, affording the participant's words primacy allows to the reader fuller access the multiplicity of their perspectives.

Chapter overview

This chapter is organised into two main sections. The substantive part is concerned with reporting the main data findings for each of the five themes, *Drivers not Mechanics, Memes: Mechanisms, messages, and mayflies, The Persistent allure of gothic pedagogy*, *Darwinian pedagogy and Pedagogical engineers* (see Table 7.1). I complete the chapter with a summary that gives the significant findings for each theme. I next begin the by-theme interpretation with the first theme.

Theme One: Drivers not mechanics

I'm yet to be convinced

None of the participants were directly asked to give an account of their knowledge of brain science because as I argued earlier, my overall research intention was to obtain thick and contextually relevant data. Rather than asking about their neuroscience knowledge in an artificial and divorced way, I concluded that was necessitated was an exploration of participant explanations acquired through detailed discussions about operational devices. Thus, I arrived at a tentative but in-situ assessment of their level of understanding of neuroscience by analysing the explanations given of the operational devices. All the participants displayed only an extremely cursory (60 per cent) or incorrect (40 per cent) mobilisation of neuroscience knowledge during these explanations. Participants typically either just referred to "the brain" on its own or conflated it with, in order of decreasing frequency, vague references to memory, activity, use, synapses, neurons and dendrites. Only one participant volunteered an assessment of their level of brain anatomy and functional knowledge, thus:

> In comparison to my Year 7, I know quite a lot about the brain works, compared to a neuroscientist, very little. In comparison to the rest of the teachers in the school, about the same … I know about neurons, synapses, electricity. I can do all that sort of stuff … I know a little about the biology of the brain, how it works. If you asked me to name the sections I would have to look in a book (Grace).

All participants professed recognition of the term brain-based education (see Figure 8.1). Only four of these could offer an understanding of brain-based education that corresponded to the presentation of the term as understood by both the practitioner and academic literature. Typically, the answers were brief and vague. There was however, no attempt to conflate brain-based education with neuroeducation or neuroscience. Only two participants ventured to answer what neuroeducation was. Their explanations, although brief, were broadly similar to those found in the scholarly literature.

Table 8.1: Numbers of participants who explained each operational device

Operational devices	**EE**	**Mozart Effect**	**Mind Mapping VAK theory**	**Brain Laterality Brain Gym® AL**	**WBL MI**	**10 per cent Myth**
No. of commenting participants	6	5	4	3	2	1

[For tables, the following abbreviations apply from this point forward; AL=Accelerated Learning, VAK=VAK theory, MM=Mind Mapping, MI=Multiple Intelligence theory, ME=Mozart Effect, BL=Brain Laterality, EE=Enriched Environments and WBL=Whole Brain Learning.]

Table 8.1 summarises how many participants tried to explain each of the operational devices. The low response rates in Table 8.1 show that there was a general reluctance to give explanations. Where explanations were offered, typically they were also vague and muddled. Although there was limited data, I have categorised the quality of explanations as per Table 8.2 on the specific dimension of accuracy of contested science. Despite the relatively prominent levels of professed awareness of each of the operational devices (see Figure 8.1) only VAK theory was accurately articulated in terms of its underpinning but contested science. One participant resorted to using her laptop to search for an explanation of Accelerated Learning, being unable to recount it to her own satisfaction.

Table 8.2: An analysis of the understanding demonstrated for each operational device

Well understood	**Weak understanding**	**Extremely weak understanding**
VAK theory	Mozart Effect Enriched Environments Whole Brain Learning Mind Mapping Brain Laterality Multiple Intelligence theory 10 per cent Myth Accelerated Learning	Brain Gym®

My assessment of the level of understanding of the rest of operational devices is that they were weak or extremely weakly understood in terms of their contested science. For all the operational devices, a large majority of all the participants struggled to articulate how its contested brain science translated into practice, i.e. they could not explain how the operational devices should be implemented.

Of the ten participants who commented, seven felt that acquiring a functional and/or abridged understanding of neuroscience as it related (albeit in a limited way) to teaching would not enable them, or other educators to become more effective. Example 8.1 illustrates representative opinions on both sides of the argument.

In favour of neuroscience knowledge acquisition:

I'd like there to be a drive to use MRI to find out what's going on in the brain in a learning environment, to see a kid while they're learning and to see what we can learn from that … It's always been a challenge as a teacher to understand about how and why people learn and it's nice to have that picture of what's going on in your head (William).

Against neuroscience knowledge acquisition:

It hasn't been one of my driving forces to find out how the brain learns or how it works … If I believed that [knowing about the brain was important] I would know more about it but I'm yet to be convinced. I think the actual physical way a brain works is not really relevant to learning ... If I thought that it [neuro scientific content] would be there [on teacher training courses]. I've been on the TEEP training, various people will come into school and talk about various things and we've had various INSET, and it's all very interesting, but it's never really made me feel, if I knew more about this I could be a really effective teacher (Grace).

Example 8.1: Representative participant comments for and against educators acquiring neuroscience knowledge

As a profession, we are not academics

There was a lack of shared meaning amongst the practitioners when they used the word research. Two participants (six mentions) specifically conceptualised research as that have been accepted into the canons of knowledge (I have called this academic research). Alternatively, Audrey discussed a second type - 'research-in-action'. This resonated with William's assessment of fellow educators suggesting that they typically didn't have the capacity to research, rather, they just looked for visible results in the classroom. A further eight participants used the word research interchangeably to mean both conceptions. Only two participants said that they would check the academic research behind any new initiative.

There was a prevailing view that teachers were too busy to do any of their own academic research, even if they wanted to (seven participants, 10 mentions) as Richard elucidated:

> If everyone had to be an academic about education, I don't think that's sustainable – I don't think there's enough room in someone like me to be that up-to-date and on top of educational theory at that level in every aspect of their job and to be a practising teacher (Richard).

Audrey similarly agreed with this proposition thus:

> I'm not the sort of person to wade through research … you are doing just enough in your day to day job to keep your head above water without having to understand the science or research behind things ... I mean somebody could come with a whole load of research and if I had the time I would love to delve into it, but my job is as a teacher (Audrey).

On balance, but only just, there was a feeling amongst participants that it was more important for them to know that an initiative worked for them rather than to understand why it worked, with five participants (nine mentions) commenting to this effect, as Audrey articulated, "If I've got something in front of me that works I'm just going to use it. If I have to sit and read why it works, I find that difficult". *Sui generis,* Richard thought that educators should want to know about theory and believed that there was a definite role for an intermediary thus:

> But they should, the ideal would be that they would want to know the theory and understanding that there is a role to play for people to provide that help to the school leaders of teaching and learning as part of their education to understand the theory, to be better at applying the models in the classroom and trying to facilitate that evidence-base into practice (Richard).

Penny summed up the general sentiment that the prime role of educators was to educate students rather than be researchers or academics who question everything they are told, "Because as a profession we are not academics". She upheld the position that the scrutiny of any new initiative should be entirely focused on the likely impact on academic standards as determined by educators.

Prima facie acceptance

All participants (32 mentions) spoke on the topic of how they responded to new teaching initiatives. On the matter of validating the claims of new educational initiatives, eight participants made 10 mentions. The majority view was that it was the responsibility of the organisation or the individual who owns/sells/creates the educational initiative to be sure that any impact-based or evidence-based claims are valid, trustworthy, and reliable. Miles explained this point well:

> Any organisation, if they are going to sell something have a responsibility to make sure it's valid and that it's evidence-based and that it's going to have an impact. I certainly feel quite strongly about that (Miles).

Once introduced to any new teaching initiative five participants (nine mentions) said that they accepted it at face value, adopting the stance that if the initiative had got past the 'front door' of the school or LA then they felt absolved of any responsibility for further investigatory work. This included confirming for themselves the provenance and/or accuracy of either the improvement claims in terms of school metrics (what I have called impact-claims) and/or substantiating the epistemological basis of the initiative (what I have called research-claims). Four further participants (five mentions) said that they thought that this was the stance adopted by most educators. Suzanne observed that in the absence of any discussion around the research-claims or impact-claims during any of her PD she assumed that other educators were also happy to accept the various initiatives claims at face value. Penny agreed:

> It's not only time constraints, I just think why should they question everything they get told? I don't think they do that. If they get told something - it's like when Ofsted came in and said these are the new standards, they just said that's right. And it's because someone comes in and they've done some research they are just going to say "Ok, fair enough" (Penny).

This stance was equally evident with all the six participants (of 15) who discussed the operational devices within the context of TEEP PD. Of these, two participants confirmed that they had unquestioningly accepted all the TEEP material including the research-claims and impact-claims presented within it because they respected the two LA TEEP trainers "so happy to go with it … so it was almost like [names of two LA TEEP trainers] had done the research for me" (Audrey). One participant said that he had "trusted Gatsby to do all the checking out so that it was OK to use" (Paddy). Five participants (eight mentions) said that they would usually do their own follow-up checks to confirm the numerical accuracy and school context of any data put forward as an impact-claim about the efficacy of a new initiative. James cautioned however that if educators were too sceptical about the research-claims of new initiatives an undesirable consequence would be that educators would not try them out to see if it they work for them. Participants, on the whole, appeared to have prima facie accepted the pseudo-scientific claims relating to the operational devices' underpinning neuroscience and derived theory. No participants said that they had contested any of the operational devices they professed to have an awareness of when initially introduced to them. Nine of them (34 mentions) said that over time, they did begin to question the pseudo-scientific theory behind some of the operational devices.

This concludes the data findings on the first theme, *Drivers not mechanics*. This theme has collated the participant's responses on their knowledge of brain-based education, its operational devices, neuroscience and how their main preoccupation is not knowledge per se but knowing that a teaching strategy works.

Theme Two: Memes, mechanisms, messages, and mayflies

This second theme collects together the findings from the data concerning the spread and communication of brain-based education, its content, its ideology, and its practices. It begins with the findings that relate to the participants encounters with brain-based education.

Meme encounters

All the participants said that they had heard of the term 'brain-based education'. An overwhelming majority of the individual operational devices were known to many of the participants as Figure 8.1 shows. All participants said that they had heard of Accelerated Learning and VAK theory.

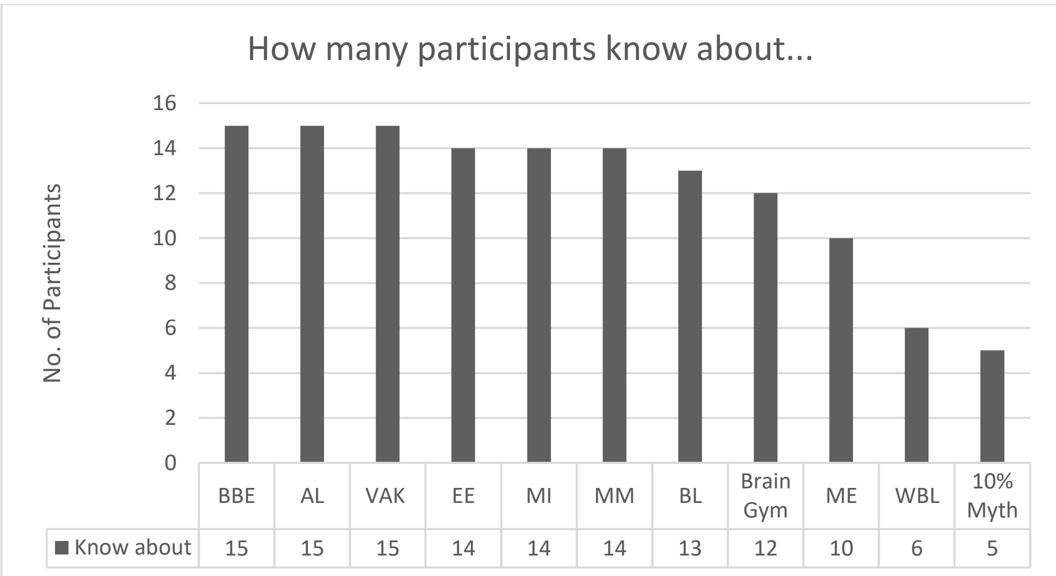


Figure 8.1: The awareness of the participants of brain-based education and each of its operational devices

Most participants reported that they had encountered brain-based education from multiple, varied sources on many occasions over a substantial timeframe. The time frame for interacting with brain-based education started in the late 1990's and it persisted, as Miles and Mabel clarified, right up to the time of the interviews (12 participants, 20 mentions). The carriers of brain-based education information included local organisations (LA, ITT and the GTP), national organisations (SNS, Ofsted), external national PD companies, school-based (School Leadership Team (SLT) or Advanced Skills Teachers (ASTs)), independent consultants (e.g. L2L consultants), books and conference speakers and other educators.

The participants talked in more depth about their 'TEEP-without' encounters with brain-based education than their 'TEEP-within' encounters. By TEEP-without, I mean those encounters with brain-based exogenous to TEEP PD. The TEEP-without encounters appeared to substantially pre-date the TEEP encounters. Three participants made heavy mention (12 mentions) of L2L as their first contact with brain-based education. Five participants (five mentions) noted that the TEEP encounters served to reinvigorate and reinforce earlier encounters as Audrey observed "because they weren't really new things, but we were refocusing on in a different way and it re-engaged us again".

Meme advocacy and propagation

Brain-based education had been advocated and propagated by various organisations that had influential roles with educators, especially on matters of teaching and in particular, models of practice. Nine participants felt that brain-based education had been advocated and propagated by the LA. Three participants credited SNS with a lead part in the propagation and endorsement of brain-based education as a legitimate and efficacious model of practice. Eight participants felt that Ofsted were actively looking for differentiation during inspections of teaching. Mabel felt that Westford's teacher training programs had historically delivered "full-fat instruction on brain-based stuff to their trainee teachers, but to be fair, they've scaled it back now. It's a lot less in-your face these days but it's still there".

Table 8.3: The extent to which the scrutinised documents mentioned brain-based teaching strategies/methodologies in a normative way

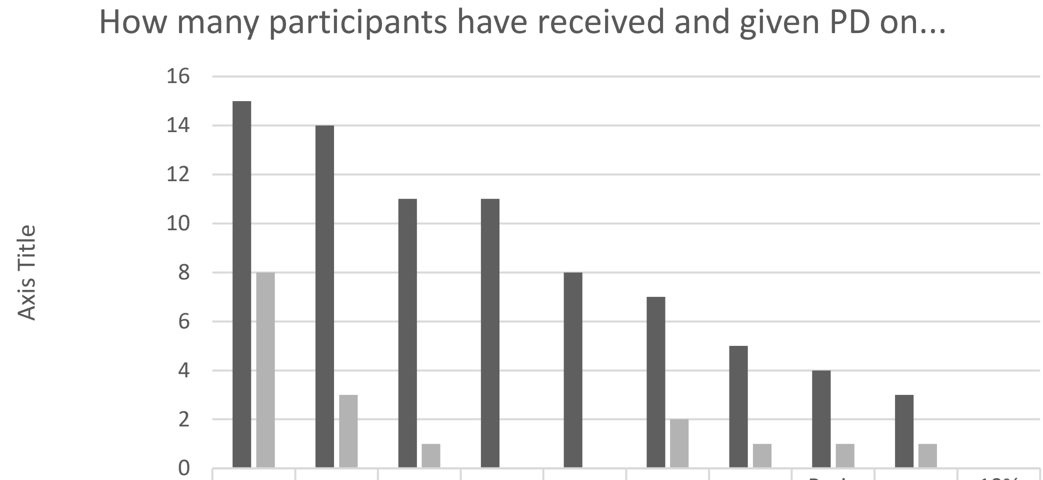
Document type	School policies	School lesson plan templates	Sundry documents
Brain-based teaching strategies/methodologies mentioned in a normative way	13% (4 of 30)	33% (4 of 12)	100% (3 of 3)

10 participants (10 mentions) considered TEEP to have promoted and advocated the use of brain-based education. Six participants thought that TEEP had promoted 'most' brain-based strategies/ methodologies: two participants thought that TEEP had promoted 'all' the operational devices. Three participants said that they felt that teachers were obliged by their school to incorporate operational devices in their day-to-day teaching. As Table 8.3 shows, the documentary scrutiny revealed that in the case of the school lesson planning templates, only 33 per cent contained an explicit section for teachers to record their use of brain-based education. Only 13 per cent of the school policy documents mentioned brain-based strategies/methodologies normatively. Kate described that "On [name of school] we use symbols in our planning so that if you are using Accelerated Learning you put a little brain – that was my idea." All the sundry documents scrutinised contained at least one normative reference to the use of brain-based education as a routine model of practice.

Meme PD

The principal mechanism for acquiring a detailed and working knowledge of the operational devices was principally through formal face-to-face PD sessions. All participants confirmed experiencing PD on Accelerated Learning and VAK theory. The other most popular operational devices for which the participants said that they had received PD on included in descending order Mind Mapping, Multiple Intelligence theory (73 per cent of participants), and the Mozart Effect (53 per cent of participants). These are represented in Figure 8.2.

Fewer participants had delivered brain-based PD, as Figure 8.2 illustrates. 89 per cent of the nine participants who spoke on this topic said that the brain-based PD had occurred in their own schools: 56 per cent of these participants said that they had conducted brain-based PD in other LA schools. The majority of these nine trainer-participants (89 per cent) noted that their brain-based PD had been delivered to school-facing personnel – mostly teachers and SLT but also Teaching Assistants and LA staff. Dave was unusual in that he had also run regular PD sessions on VAK theory for school nurses, youth workers and the police.



	AL	VAK	MM	MI	ME	BL	EE	Brain Gym	WBL	10% Myth
Has had PD on	15	14	11	11	8	7	5	4	3	0
Has given PD on	8	3	1	0	0	2	1	1	1	0

Figure 8.2: A summary of how many participants have received and given PD on each of TEEP's brain-based teaching strategies/methodologies

Meme experiences

There were two main types of PD experience, TEEP-without PD was typified by a style over substance approach whereas TEEP-within PD was presented in a more detached manner. When the participants talked about the TEEP-without PD on brain-based education, what was notable was the positive and intensely flattering language they used to describe their trainers and the delivery methods they used. Six participants (20 mentions) identified a TEEP-without Accelerated Learning trainer by name. David Moffatt (pseudonym) was uniquely associated with the introduction and subsequent proliferation of Accelerated Learning by this entire cohort of participants. These participants were all acutely aware of Moffatt's materiel. Four participants explained in depth (15 mentions) how 'magnetic' a trainer they had felt him to be. The comments in Example 8.2 illustrate the perceived guru-like and charismatic nature of Moffatt. Two further participants each described the founders of TEEP and L2L as being guru-like.

To be honest the training [with David Moffatt] was fantastic, it was exceptionally slick. He sold it very well. He was very good at what he did. He was very entertaining, he seemed very knowledgeable … I fell for it hook line and sinker… He's very slick, he's very good at what he does he's a very good presenter, very charismatic (Miles).

He was 'Mr Energy'… It reminded me of a [?], direct salesman type thing, big stage, big posters, loud music, jumping with energy, I can see how you could be mesmerised by this type of thing, thinking this is a good thing (Hannah).

Example 8.2: Representative participant comments on the delivery style of the TEEP-without Accelerated Learning PD

Comments about the LA TEEP trainers were less frequent and less effusive (four participants, six mentions). Commentary instead deferred to their professionalism, respected standing, and knowledge rather than their outward charisma and showmanship skills. Hannah confirmed the deliberate policy of Westford was to use excellent and locally respected educators to deliver the TEEP PD in order to maximise its impact with attendees.

Four participants (20 mentions) discussed how their brain-based education PD had been a very positive, enjoyable, and collegiate experience. All these expressed the sentiment that the PD gave them a lifted and enthused feeling: the word 'buzz' was commonly invoked in their explanations. One participant noticed that her co-attendees expressed similar positive thoughts, making remarks like "Oh, it's wonderful!" (Audrey). Amongst the participants there was a feeling that the PD helped them to remember what it was to be a student and to learn in the classroom environment. Suzanne said that the PD activities were "fun, hands on and made you think". Two participants rated their initial PD on VAK theory as excellent because for them it had demonstrated what it was like to be on the receiving end of great teaching. Furthermore, four participants (four mentions) noted that they felt that all their brain-based education PD resonated with them as teachers, as the excerpts in Example 8.3 testify. This warm fuzzy feeling was not just confined to educators. Michael said that his peripatetic VAK theory PD "went down a storm" with 'his' school nurses, youth workers and police who were frequent visitors to the school.

As an experienced teacher I thought "Yes, Yes, Yes!" I recognised lots of the things he said. Absolutely yes, and the other teachers thought the same (Steven).

For me, some of the things that were being said and done resonated with practice that I'd perhaps done intuitively, the course, it was sort of a re-affirmation of some of the things I'd always believed in and occasionally remembered (James).

Example 8.3: Representative participant comments on how the brain-based education PD (within or without TEEP) resonated with them as educators

Six participants recalled that their brain-based education PD tended to be more about style than substance (eight mentions). There was acknowledgment that the trainers and their methods were slick, professional, and consummately appealing but that something was missing: the interview excerpts in Example 8.4 are illustrative.

David Moffatt, my personal opinion, he's a showman. He gets teachers enthused because of his charisma, not because of the message … But the material is weak (Hannah).

The practical aspects of the courses outweighed the messages (James).

The David Moffatt training methods were really great, but he really spread out a lot of content very thinly (Mabel).

Example 8.4: Representative participant comments on the perceived matter of style over substance of the TEEP-without PD

Message in a meme

There were four main findings about the messages that were transmitted about brain-based education. The first finding which covered all PD on brain-based education was that eight participants (of 15, 12 mentions) indicated that brain-based education had been put forward as being brain-compatible. Five participants (of eight) said that brain-based education had been put forward as being predicated on uncontested neuroscience. Mabel speaks best for this group thus:

> I can remember the training going on about the decade of the brain and how the brain-based methods were basically just classroom applications of what all this new brain science research was telling us about the best way to teach (Mabel).

The third finding was that there was a large feeling that the brain-based education was routinely put forward as being best practice or good practice, with 73 per cent of all participants indicating that for them this was the case. With one exception the two labels were used by the remainder of the participants interchangeably to mean the same thing.

The fourth finding was that six participants (nine mentions) said that as they had been told that TEEP had caused improved academic results and/or teaching quality at schools that had implemented it, by association, being one of TEEP's five underpinning tenets, the same was true of brain-based education. Example 8.5 brings together the most cogent of these opinions.

> [Names of creators] explained how it had turned their school around. They didn't give numbers but said how it had changed lessons from satisfactory to good and things like that. [Names of creators] said that it had highly improved lessons … (Suzanne).
>
> When I first went on the … [TEEP] course there … was a head teacher of a school either in special measures or challenging circumstances and they needed something that would make a massive impact on the kids. I can remember her quoting as "This is what we did" and the results soared… It was based in a real school in a rough challenging situation and it impacted (Audrey).

Example 8.5: Representative participant comments on the efficacy of brain-based education in problematic school situations.

Last week's best flavour

The principal finding here was that brain-based education was perceived to be an initiative that had fallen out of favour (13 participants, 25 mentions). Ten participants said that it had been extremely popular in the past. Audrey explained that brain-based education PD was *the* thing to do at one time. Broadly representative of the commentaries on the individual operational devices was that of VAK theory, which was no longer considered to be the "in-thing" (Audrey) or the "thing of the moment" (Hannah). Michael suggested that "it may be old hat now" since teachers were happy to denounce it moving onto the next new initiative. Accelerated Learning garnered similar levels of participant comment and sentiment, "Yes, one of the problems is … it can be cyclical, and it can be quite fashionable, can't it?" (Michael). Two more participants noted that whilst Accelerated Learning remained an integral part of TEEP it had little currency on its own now as a standalone methodology.

Seven participants (12 mentions) observed that that the formerly substantial and widespread structural support for brain-based education had dwindled away. Reasons proffered included reductions in the LA TEEP PD provision (four participants), the death or the refocusing of the original creators onto new projects, and the gradual removal/disappearance of the array of home-grown and organisational resources to support brain-based education. Discussing the removal of LA personnel, Paddy commented, "Because there is no strategic lead that is keeping [TEEP] topped up and reminding people and giving people new ideas and fresh insight into it". Hannah and Audrey suggested that educators naturally tended to go back to their default model of teaching once any educational initiative ceases to be actively promoted, as Hannah expanded this observation thus:

> If you haven't got somebody leading whose enthusiastic and modelling the practice it quickly dies out, it becomes last week's best flavour and if you're not being encouraged or motivated … then yes it will die out and they'll all go back to how they were trained (Hannah).

This sub-section has considered the findings that relate to the lifecycle of brain-based education. More widely this theme has presented the findings that addresses practitioners' exposures to and the transmission mechanisms and messages of brain-based education. In the next theme, I focus on the data findings that concern the appeal of brain-based education.

Theme Three: The persistent allure of gothic pedagogy

The allure of a gothic model of practice

There were multiple reasons given by participants for their attraction to brain-based education. 11 participants (11 mentions) considered brain-based education to be best or good practice. Eight participants (14 mentions) said that the appeal was rooted in a desire to copy the practices of good colleagues. Grace commented, "You go in and watch good teaching. You see what they do. Then you try to do it yourself". The impact of seeing good teachers practice brain-based strategies/methodologies in a comparable classroom was enduring. Michael recalled how one of his old colleagues had positively influenced his perception of brain-based education a long time ago:

> In my old LA, the schools were dysfunctional, in disarray, in special measures but there was the isolated superb practitioner. There was a maths AST

teaching the unteachable kids who used some brain-based methods in his lessons (Michael).

The power of seeing a colleague demonstrating how brain-based strategies/methodologies worked for 'difficult' students was another substantial appeal as the interview excerpts in Example 8.6 reveal.

I think seeing somebody in a lesson in your school with your kids modelling it; it's very attractive for people who are struggling with those kids in a struggling school (Audrey).

They had been allowed to discover that it is a good pedagogy for themselves. It's a truism in School Improvement, the most cynical "I'm not doing that" type of teacher, you put them in front of a superb teacher and they do not remain unaffected. It's no good talking about the theory or showing them a video of the classroom. Even when you say that's a school in very difficult circumstances (like those in Dagenham or Barking) they just say, 'So what?' You put them physically there and most say "Wow!" (Michael).

Example 8.6: Representative participant comments about the power of seeing a colleague demonstrate brain-based strategies/methodologies with difficult students

There was an overwhelming feeling that there was something "Wow!" (Paddy) about brain-based strategies/methodologies. 80 per cent of all participants commented that they appealed because they were thought to be either new, different, innovative, pioneering, or exciting (15 mentions). William offered representative exemplification with "It's a novelty – which is everything in teaching. It makes them stand out from other teachers, makes them look different". There was a feeling that brain-based education was something for teachers to believe in, a way for teachers to channel their energy and to get enthusiastic about (three participants, three mentions). Four participants (one mention each) noted that the enthusaism and energy of other educators who used brain-education was quite infectious. Hannah and Kate contended that because TEEP was put forward as a 'good idea', the brain-based part was tarnished with the 'good idea' brush too. Hannah argued that "We need something to get us excited about" whilst James asserted that "One benefit of brain-based education was that it gave us something to believe in and to put out efforts into".

Four participants (five mentions) believed that the adoption of innovative teaching initiatives could lead to enhanced career progression. Miles explained how this appeal was amplified for younger and/or ambitious staff:

> I saw it as a way to move forward with my own career. I could establish this, I could run with it, it was new … and innovative and that would certainly help my CV. I certainly feel that I see that in young members of staff who are aspiring to leadership roles. They are very keen to appear to be innovative to do all these different things (Miles).

Two participants (two mentions) said that the appeal of brain-based education was because educators believed it would enhance their professional standing. James elaborates:

> Sometimes teachers like jargon, some might think that using the jargon of new programs may make them look more professional, but some won't. It's the professional lexicon … Because teaching is hard teachers do like to think that it is a profession with its own techniques and that it has its own professional language. The more stuff like this, the more teachers think they have skills, "I know about this" (James).

The more grounded subject of practicality also featured as a strong topic amongst participants, eliciting 12 mentions from nine participants. Participants felt that the operational devices could be used across the curriculum. Their anticipated ease of implementation made them an attractive proposition for six participants, "Some things were picked on. People started to use Mind Mapping, Multiple Intelligence theory and Brain Laterality because they were quite easy to use." (James). Four participants said that because they often came fully resourced they saved valuable planning time. Four participants described how Accelerated Learning had "cleverly packaged" (Suzanne) up all the brain-based teaching strategies/methodologies and presented. This tied in with Mabel's suggestion that brain-based education was a new initiative that had been written with educators in mind. Four participants noted that educators invariably wanted any new initiative to provide them with ideas and/or resources that could be easily and readily be put into action. Audrey confirmed that "One thing I've always said is that when we go out on courses … These [operational devices] were things we could actually put back in place very quickly and easily". Hannah agreed, "When they come to training they are delighted when they come away with hand-outs that do the next lesson for them". Besides, as Leonora challenged "What's not to like about it?"

Despite the finding in Theme One that participants typically had a poor understanding of most of the operational devices, another factor for four participants (one mention each) was that they were easy to understand and to explain to others. Six participants (16 mentions) felt that they could personally relate to the theory behind some of operational devices. Five participants (15 mentions) cogently discussed their own profiling experiences with VAK theory inventories, and how for all but one of them, finding that VAK theory fully explained why they, as children, had struggled with learning. Leonora's quote is both poignant and revealing:

> I know now that I'm a visual kinaesthetic learner, I know that from certainty from all my experiences … I can't do it in my head, I can't read things on a screen, I like to have visual things. After I heard about VAK theory I self-profiled. It explains why I struggle academically (Leonora).

The appeal of 'explainability' or 'relatability' extended to that of their students. VAK theory and Multiple Intelligence theory were found to explain their students' preferences, behaviour, and often, lack of progress (thirteen participants, 13 mentions). Kate used VAK theory to explain the former:

> Some kids are better visually looking at something to be able to remember and understand it. Some kids are better at listening to something, which might mean it's a certain patter or it's like a musical thing like a rap or something that helps them to remember or they just like verbal instructions. Some people like to do hands on things to be able to get it, to do something or write something or even draw something (Kate).

Six participants (seven mentions) indicated that brain-based education enabled them to understand why some educators were poor at teaching. VAK theory was used to illuminate this idea:

> If you only teach in the way that you understand, not all students will learn and become frustrated. We are talking about providing enough, varied VAK theory style opportunities … it's important not to discriminate or disenfranchise the children who don't learn in that way (Leonora).

This seems to be, to a considerable extent, the opposite factor of being a good teacher or copying role models previously discussed at the start of this section.

The metaphorical pedagogical Holy Grail

Seeking out the metaphorical 'Holy Grail' of teaching was perceived to be a crucially important aspect of being a successful teacher eliciting 20 mentions from 13 participants. Paddy preferred the idea of the "Magic Bullet", whereas Michael and William referred to the "Panacea Effect" but the sentiment was identical as Hannah explains, "The something that works. Yes, the quick fix, what can I do in my classroom?". Penny believed that constantly searching was part of being professional, "Members of staff are professionals and we should all be looking". Audrey noted that this was an attribute of successful educators, thus, "I think they're successful because if something doesn't work they will actively seek something else". Audrey's assessment that this was a characteristic of successful educators was shared by four others. Of these, Miles frequently revisited this idea during the course of his interview, (six mentions), as this compelling edited sequence shows:

> We can all find that thing that doesn't work, it's finding that thing that does work ... Again, it comes down to that we're all looking for that thing… That's what we want to do, find something that's going to change the lives of the individuals we work with, that are going to make us better teachers and those better learners … There are those of us who want to improve are constantly looking for that thing that's going to give us that sound thing that when we go into a room and it works. I'm not looking for a simple algorithm … But we have to try to find things … I'm still looking to become a better classroom teacher by finding that something (Miles).

Pedagogical promiscuity

Seven participants (15 mentions) acknowledged that their quest for the metaphorical Holy Grail of teaching created a vulnerability for them. They recognised that they were at risk of falling victim to possibly dubious teaching initiatives, but they generally thought that this shouldn't preclude them from keeping an open mind and still believing that there was a teaching initiative waiting to be discovered that would be the answer to all their problems. Seven participants made specific mention of this vulnerability (eight mentions). Example 8.7. captures the best of these observations.

Really, teachers are totally at the mercy of being hoodwinked by the multitude of dodgy initiatives that come along all the time (Mabel).

That's the problem, we end up being blown in the wind and whatever comes along we respond to (Miles).

Example 8.7: Representative participant comments about the vulnerability that comes with being open-minded

Six participants (one mention each) believed that 'bandwagons' were rife in education and that brain-based education fell into this category, with Grace introducing them in the context of the next new thing, “I mention the word ‘Bandwagon’. In my career, there have been lots and lots of bandwagons, people make careers out of bandwagons”. Audrey included schools in this phenomenon “Schools, because we are judged against each other we will always go with the next new innovation”. Nonetheless the participants continued to assert that that there was really nothing to lose by having an open mind to actively seek out new models of practice (four participants and five mentions) as Michael, articulated:

> Absolutely, it’s important to keep an open mind.... That doesn’t deny you being critical, even if you think it’s good, it shouldn’t lead to you closing your mind to other things because the research is constantly evolving (Michael).

This concludes the presentation of the data findings about the reasons why practitioners are attracted to brain-based education, why as effective educators, they are perpetually looking for the metaphorical Holy Grail of teaching, even if this puts them at risk from being duped by unscientific teaching initiatives. In the next theme, I collect together the findings concerning the extent and diversity of ways the operational devices were used by practitioners. I commence with the findings about practitioners’ own use of these.

Theme 4: Darwinian pedagogy

Participant use

The self-reported use of the operational devices, both historical and that at the time of the interviews, is displayed graphically in Figure 8.3. The 10 per cent Myth was not reported as being used at all – either currently or in the past by any of the participants and this accords with the fact that there is no direct classroom teaching strategy associated with it. VAK theory and Mind Mapping came out as being the most used. Of the 10 participants who reported using VAK theory, three said that they only used its multisensory variant because they wanted to make sure that their students’ VAK deficits were catered for, as Mabel explains, “If I only ever teach the visual kids with visual stuff, they will never get better at the listening and the doing side of things. They need a balance and a chance to develop their deficits”. The participants reported that they were using all the operational devices less than they had done in the past.

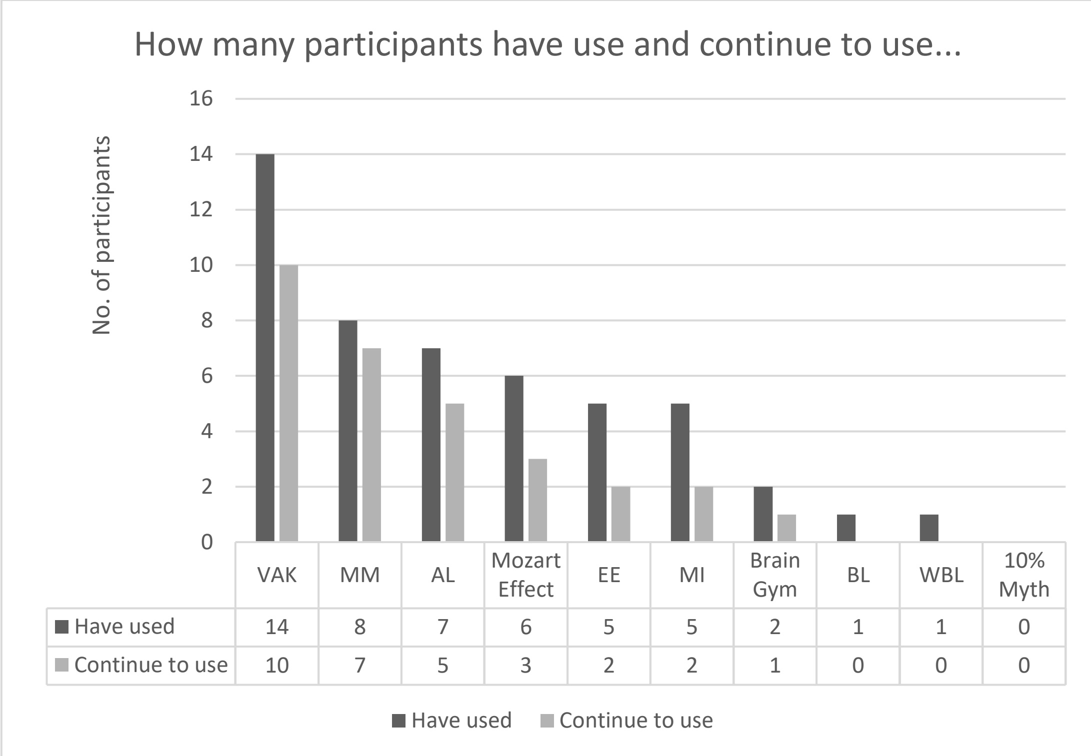


Figure 8.3: Historical and contemporaneous use of the operational devices of brain-based education

Table 8.4 summarises the findings about the extent of use of the operational devices for the four participant lesson observations conducted and equivalent for the documentary scrutiny for the participant who supplied populated lesson plans in lieu of an observation.

Table 8.4: Non-interview use of operational devices of brain-based education by participants

Non-interview participant use	**Lesson observations**	**Populated lesson plans**
Presence of the operational devices	0% (5 of 5) These are representative of contemporaneous use.	Mentioned 4 times in 5 lesson plans: VAK theory (2 mentions) Accelerated Learning (2 mentions) These are representative of contemporaneous use since they are circa 2013.

The declining pattern of use was rationalised by the participants as they discussed why they tried out and then subsequently used or not used the operational devices of brain-based education.

Amount of educator use according to documentary scrutiny

Table 8.5 summarises the results of the remaining documentary scrutiny as it relates to the use of the operational devices. It illustrates that there appears to have been a relatively limited penetration of brain-based education into school documentation. Equally, it shows that there was a relatively limited amount of intended use in the populated lesson plans.

Table 8.5: A summary of the remaining documentary scrutiny for the use of the operational devices across Westford LA

Name of document (Total number)	Indications of use	Representative of historic or contemporaneous use?
Lesson plans (33)	1 reference to the use of Accelerated Learning 1 mention of the use of VAK theory 1 mention of the use of music	These are representative of historic use since they are predominantly circa 2010
School lesson planning templates (12)	5 mentions on 4 school lesson planning templates; 4 normative mentions of the use of VAK theory 1 normative mention of the use of Accelerated Learning	These are representative of contemporaneous use as they were the documents in force at the time of data collection
School documents (25)	3 normative references to the use of VAK theory mainly in the context of differentiation	These are representative of historic use since they are circa 2010-2011
Sundry (2)	TEEP action research report (1) No mentions of any operational devices The PD PowerPoint used with GTP students in the LA is about what makes an outstanding lesson. It referenced the use of Whole Brain Learning, Mind Mapping, Brain Gym® and the multisensory variant of VAK theory.	Dated 2008-2009 so representative of historic use This is representative of contemporaneous use as it was in use at the time of data collection.

Use by other educators

Lesson inspections and/or mentoring or coaching work conducted across Westford prompted 11 participants (29 mentions) to comment on their impressions of the extent of use of brain-based strategies/methodologies. The consensus (five of six participants) was that brain-based education was not currently being used much. Paddy thought this was representative of its general decline. Three of these six participants attributed the reason to the type of educators they were working with, namely weak ones because they associated the practice of brain-based education with good educators. Example 8.8 captures the best of these.

I'm seeing them [operational devices] where there is outstanding teaching but I'm not seeing very much outstanding teaching but then that's possible because when I'm asked to go in and look, it's usually because I'm being asked to look at people who are less than good (James).

They are not using them because I'm working predominately with inadequate teachers. If I worked with good teachers I'd probably see a lot of that happening, things like Multiple Intelligences, VAK, Enriched Environments – it's a given isn't it – it's one of the most obvious things ever … If I came across teachers using them, it would be because they were very good teachers (Leonora).

Example 8.8: Representative participant comments on the consensus that the use of brain-based education was the preserve of good educators

Four participants (six mentions) concluded that they had seen brain-based strategies/methodologies included on educators' lesson plans, but that these were not apparent during the subsequent lesson observation. Michael's remark below was telling:

> I often saw [brain-based strategies/methodologies] identified on incredibly complicated lesson plans. Lesson plans that were so complicated that it was hard for the teacher to follow. In theory, it was there but somehow the lesson got in the way. I saw it on paper but not in practice (Michael).

Only the specific operational devices of the Mozart Effect, Brain Gym®, Multiple Intelligence theory, Mind Mapping, Accelerated Learning, and VAK theory were discussed (11 participants, 40 mentions). VAK theory elicited the most comment. Nine participants made 22 mentions about the use of VAK theory by other educators and/or schools. The majority opinion (Seven participants, seven mentions) was that historically VAK theory had been used in a substantial way. Six participants commented specifically on their impressions of the current practice of VAK theory (six mentions). Of these, five participants (5 mentions) suggested that other educators had ceased using VAK theory, "There are a few lesson plan formats in Westford where VAK theory is actually listed. I think [name of school] is one of them, buts it's totally disregarded, the box is left empty – it's becoming less and less popular" (Leonora).

Same name, different game.

All the participants discussed how they use (or had used) the operational devices of brain-based education and nearly all were used in a way that did not correspond with its original intended use. The results of these discussions are represented in Table 8.6.

Table 8.6: Range of uses of the operational devices as described by the participants

Used for/as (and number of mentions)	**Individual brain-based strategy/methodology**
Exam revision strategies (4 mentions)	Mind Mapping
Behaviour management strategies (9 mentions)	VAK theory, Mozart Effect, Brain Gym®, Enhanced Environments
Differentiation strategies (14 mentions)	VAK theory, Mind Mapping and Multiple Intelligence theory
Development of student organisational skills strategy (4 mentions)	Mind Mapping
Literacy strategies (3 mentions)	Mind Mapping and Multiple Intelligence theory
Curriculum design (2 mentions)	Multiple Intelligence theory
Formative assessment strategies (2 mentions)	Enriched Environments
Episodic lessons (9 mentions)	Brain Gym® and Mozart Effect
PL strategies (9 mentions)	VAK theory and Mind Mapping
Staff development strategies (7 mentions)	VAK theory

Used for/as (and number of mentions)	Individual brain-based strategy/methodology
Elimination of student stress through positive teacher-student relationships (4 mentions)	Enriched Environments
Attending to physical environment (3 mentions)	Enriched Environments

As can be seen from Table 8.6, uses of the brain-based operational devices were diverse, ranging from revision techniques, seen as especially important for success in examinations, to more specific requirements such as behaviour management and literacy development strategies. The beneficiaries of the uses of the operational devices included staff as well as students.

Mind Mapping was cited as being a particularly useful strategy to employ when conducting examination revision receiving one mention each from four participants. The development of students' organisational skills was also mooted as a use of Mind Mapping by two participants who made two mentions each of this application. Behaviour management was a necessary precursor to successful teaching by many participants (9 mentions). The participants commenting on behaviour management detailed the respective uses of the operational devices they routinely employed to establish acceptable learning behaviours with their classes (see also *Theme Three: I need something that works for me now, with my students*). Paddy provided an illustrative answer thus:

> I used to play a lot of Schubert in my ICT lessons ... as the kids came in ... It had a fantastic calming effect. So, whatever was going on in the corridors, they'd stop it ... to calm them … they would become more chilled and quite receptive to whatever I was talking about … I was probably using it as a behaviour management strategy initially, but the benefits were in the teaching and learning because I could get on and do my job (Paddy).

Suzanne similarly explained how she used Brain Gym® as a behaviour management strategy with her lower ability and younger teaching groups:

> I have been using something like Brain Gym® with my low ability Year 8 groups. They can't sit still for an hour. So, we get up half way through and do some Brain Gym® style movements, e.g. spell your name with your left hand. It's used as a "Let's get up and get rid of that energy and then we'll focus

> again". It does work. I use it as a distraction technique to get them back on track (Suzanne).

One LA participant believed that Enriched Environments had efficacy as an effective behaviour management tool because they used it to foster a respect for the learning environment in their students. VAK theory was considered as a behaviour management strategy by another participant, who commented that they included a range of visual, auditory and kinaesthetic activities to improve in the behaviour of otherwise unruly students.

Suzanne, Paddy and Mabel provided insight into the way they used two operational devices to create episodic lessons (9 mentions). For Suzanne, Brain Gym® was used in the main body of the lesson to create a physical marker between the preceding and following learning episodes with a view to keeping learning on track, whereas Paddy utilised The Mozart Effect to delineate the lesson starter. James noted that historically many other educators used the Mozart Effect the same way. James said that these educators played Mozart (and other music) to mark out sections of the lesson where the students were required to reflect and contemplate the preceding learning, thus:

> I think teachers played music and Mozart at the beginning of the lesson, to have it playing as you walked in and then some may have had it playing during the periods of quiet reflection or when they had particular tasks to do (James).

Mind Mapping was thought to be a useful literacy strategy because of its ability to capture and/or map out student's thinking. The second mentioner took a more radical view, suggesting that Mind Mapping was a legitimate alternative in lieu of conventional classroom writing. One participant considered Multiple Intelligence theory as an effective tool for teaching of poetry. According to James, Multiple Intelligence theory had been used to design part of one school's Personal, Social, Health and Economic curriculum. The two participants who talked about Enriched Environments equated it to the provision of visual stimulation in a classroom environment using posters, displays and artefacts. Both participants went on to discuss how such visual stimuli more usefully acted as an annotated exemplification of the standards they expected their students to achieve.

Seven participants (12 mentions) discussed how they used VAK theory, Accelerated Learning and Mind Mapping techniques to promote personalised learning amongst their students by primarily facilitating student choice around the modality of tasks for any given learning objective. Kate typifies the observations of these participants thus when she talks about her use of VAK theory not as differentiation per se, but as the introduction of autonomy into the student learning process, "I've done [VAK theory] as when you give them loads of ways of attacking a challenge and then some of them might then want to something hands on and others writing, so give them the choice". Audrey also brought up the subject of student choice within the context of VAK theory indicating how important she thought it was to give her students choice to support their learning;

> If we can get our one task so that we have the three criteria, so a child can choose if he wants to read something about this task, want to listen to something about the task, want to do something about this task, they're learning … that's got to be better (Audrey).

Mabel alluded to this notion of personalising learning when she commented that:

> I don't think one size fits all when it comes to learning but that's not to say that I should personalise each lesson 30 times – that would be totally impossible and ridiculous, I would be on my knees with work overload .... But it is my job as a teacher to recognise that and do what I can to support individualisation of learning activities where practical and manageable, even if it is on a small scale and only from time to time (Mabel).

The notion of personalisation is also bound up with the notion of differentiation, which came out as the strongest candidate in the list of how participants said they used the operational devices, collecting 14 mentions. The operational devices given as the preferred vehicles for perceived differentiation provision were VAK theory, Multiple Intelligence theory and Mind Mapping. VAK theory received the most mentions on this topic (7 participants and 10 mentions). Three of the participants (4 mentions) explicitly said that they thought VAK theory was not a tool for differentiation. Of these, one participant said that she did not think that teachers did use VAK theory to differentiate and the remaining two of the above participants further commented that they would not as a matter of routine produce three different sets of resources for one lesson because of the investment of time that this would entail, nor would they expect other teachers to do the same. Kate clarified her thinking on VAK theory as a differentiation strategy commenting that "Yes, I know it can be used definitely as a method where visual learners are only doing visual, auditory learners only do auditory and kinaesthetic learners are only doing kinaesthetic … but I don't go down that route". Audrey said that "I think it was [a differentiation strategy] for some people".

Resembling "Jackie-style comics" (Leonora) because of their overly simplistic questioning approach, nine participants (10 mentions) reported that profiling questionnaires had once been highly popular tools in schools for categorising the individual students into the learner types according to operant operational device. This trend however "had gone off the boil now" (Leonora). William testified to the pseudo-scientific nature of the profiling inventories used:

> I think we tested every single student and we ended up … deciding that the kid was a visual learner because they scored 40 per cent as a visual, and 30 per cent as kinaesthetic and 30 per cent aural so there wasn't much variation, but they said that's a visual learner (William).

Five participants (five mentions) agreed that these profiling results, which were called a "learning passport" (Kate) at one school, were not deemed to be particularly insightful or helpful, serving just to allow staff to "pigeonhole" (Suzanne) students and "look like they were doing something proactive" (Mabel).

Only one participant discussed how Multiple Intelligence theory was mobilised to effect differentiation. The utilisation of Mind Mapping as differentiation strategy elicited mention from one participant. This was also the only mention referring to differentiation by outcome rather than input:

> The kids absolutely love it. I give them a big piece of paper and put the title into the middle, with lots of arms coming off … Kids produce different versions, all different, even though we are all doing the same topic (Grace).

Two participants (three mentions) offered an account of their use of VAK theory as a development tool for educators' practice. They both suggested that they would include VAK theory in a coaching conversation with a weak teacher to promote an understanding of how their current teaching practices could undermine the students' learning thus:

> If we're doing an analysis of a teacher who is not performing as well as they might do, we might do an audit and analysis and look for areas that might be developed and [VAK theory] might come up in conversation …. It would be

> challenged in the context of lack of variation, rather than in a specific learning style being dominant (Richard).

This concludes the presentation of the data findings concerning how the practitioners use brain-based education, their pattern of use over time, and what the practitioner's perceptions of use was/is across Westford LA. The next theme collects together the findings relating to the factors that contribute to their adoption of brain-based education. It commences with the findings about what practitioners' feel their priorities are as successful educators.

Theme Five: Pedagogical engineers

We're all being judged

All the participants talked at some length about what they believed were the fundamental problems or pressures facing them as teachers today (67 mentions). They were very firmly of the belief that their key role was to improve the attainment of their students (100 per cent of participants, 38 mentions). Many participants used other terminology to express the same view by talking about showing impact or progress rather than attainment (13 participants, 21 mentions). Richard ably expressed the views of the majority commenting that "The key point is that teachers are driven by is progress". There was also a keen feeling that being seen to demonstrate improved attainment, progress or impact in individual lessons was just as vital (seven participants, 10 mentions). Participants said that it was solely their responsibility to effect these improvements (60 per cent of participants, 17 mentions). Audrey explained thus in some depth:

> Exams! Basically, there is a feeling in the schools that teachers have to do everything. Students are not held accountable for anything. It's our fault because we didn't get it for them or we didn't access the curriculum for them. If they're not working, what have we done about it? We are having a new thing at the moment where if the target grade and the predicted grades are so many points out you have to say what intervention you are going to do about it. We are not allowed to say that the kid didn't turn up for my lesson, that's why they're underachieving. It's what are you going to do about them not turning up? So again, it's more on us. You're held accountable for how much value-added you have done for that child (Audrey).

Apparent alongside the perceived pressure to improve standards participants (six, nine mentions) talked about the need, especially during inspections of their teaching, to produce good or outstanding lessons, or at least not to get a poor grading. The excerpts in Example 8.9 express this finding.

Teachers need to get from satisfactory to good, because satisfactory is now no longer good enough (Mabel).

So, people feel the pressure to change, because they're either being observed or need to get some exam results … you know the whole term requires improvement is such a damning statement for teachers, that it makes them very paranoid and insecure (Miles).

As well as the pressure to get results, it's also been people wanting to incorporate as many of these things as they can then in the lessons they are judged on. They are utilising some of these kinds of activities [brain-based teaching strategies/ methodologies] … and people are conscious for that in lesson observations (Kate).

Example 8.9: Representative participant comments on the importance of performing at a high standard during lesson inspections

The above refers to what the participants felt *compelled* to do but there was also a strong response to what, ideally, they would *like* to do as teachers. Rather than just "teaching to the test" (Mabel), seven participants (18 mentions) indicated that they were extremely keen to enhance their students' wider skill set, prepare them for life and instil them with a love of learning. The excerpts in Example 8.10 give a good impression of the sentiment of these participants.

It is a political problem that schools are chasing exam results instead of educating the children .... But for me it's not all about academic subjects (Steven).

The most important thing, and I say this over and over again, that I believe for effective teaching is to build up this trusting relationship, so that children feel that you are there for them and that you want the best for them. That's not easy because children come with lots of baggage .... We want to develop a whole person not just their strengths … But that's the political world rather than the real world of developing kids (Grace).

I don't mind slaving over the standards cooker and getting my fingers burnt so to speak from time to time, if my teaching doesn't quite get the results SLT think are what I should. But what bugs me is the fact that you don't get a thank you for turning the kids from disorganised and unruly 11-year-old monsters into polite and focused young adults (Mabel).

If you take children who are very challenging, and when they leave in Year 11, they are polite, sensible, mature citizens and can hold a conversation, you have done wonders for those children yet that doesn't count for anything. If because it's that they have low ability skills, they only get a G. That's not good enough but actually what you've done for that child and for society far outweighs their academic skills. Yet there is no acknowledgment for that (Audrey.)

Example 8.10: Representative participant comments on the importance of developing students beyond the academic domain

I need it now, I need something that works

13 participants (13 mentions) believed that all or at least some of the operational devices had a positive impact on student learning. Ten participants said that brain-based education had improved student attainment. Michael thought that the operational devices had a wider reach than just improving attainment in one subject thus:

> I am a firm believer that [brain-based education] will improve student attainment over all … you may be doing something as a science teacher using brain-based learning that has quite significant an effect in other subjects that that particular teacher is not addressing (Michael)

A dominant theme amongst the participants was their desire to use teaching strategies that work (13 participants, 39 mentions). Audrey captured this dynamic well:

> *I'm* in the classroom day to day, I want things that work with my kids…. So, I need it now, I need something that works … If I've got something in front of me that works, I'm just going to use it ... So, it doesn't really matter that [VAK theory] doesn't work like that, it doesn't matter, if it works as a strategy in the classroom, with you in the classroom and you with your children (Audrey).

Participants largely described working in mostly terms of attainment - Mabel explained her conceptualisation of working thus:

> For me, I think that if something – a teaching strategy - works, then it must really be measurable. I would expect to see that my more of my kids had made progress, or more progress. Otherwise, why would I bother to use it? As I've already said, your neck is always on the results block these days (Mabel).

However, Suzi and Leonora conceptualised 'working' mostly in terms of attributes that are not easily measurable. Suzi articulated this idea:

> Students understand things, they seem more confident, they can understand more, and they can explain to other students demonstrating their knowledge. [They are] helping others to learn and that enhances [their] learning … They

> can apply knowledge to familiar or new situations better. If students get stuck, it takes them longer to get stuck … Students are more resourceful (Suzi).

Managing class behaviour (60 per cent of participants, 17 mentions) and engagement (73 per cent of participants, 16 mentions) were repeatedly stated as being the necessary precursor to being able to deliver both on the performativity and more altruistic fronts indicated in the previous sub-section. For example, Leonora commented "Sometimes behaviour problems need to be addressed before they can learn" (Leonora) and Steven insisted that "You must always engage the kids".

We make things that don't work, work

Eleven participants (73 per cent and 28 mentions) discussed the notion that educators take new teaching initiatives and try them out to see if they have any utility. James captured the consensus thus, "It's about trying new things – some work, some don't … Teachers have to try things – they will then find out what actually works for them". Many participants (47 per cent, seven mentions) said that if they found that there was no utility in an initiative after trying it out, then they quickly stopped using it. Audrey exemplified this position with, "Let's try it and people who tried it, if they liked it they kept it, and if they didn't like it, they didn't try it anymore and stopped using it". Part of trying initiatives out involved peer-to-peer conversations with colleagues and watching each other teach (67 per cent of participants, 19 mentions). The selected interview comments in Example 8.11 illustrate this stance well. Grace's comment's in Example 8.11 is particularly interesting because as well as near-peer dialogue, she carries out an additional dialogue with her students. Five other participants said that they routinely did this too.

> Another reason I love working here, is because [name of colleague 1] next door, and [name of colleague 2] and [name of colleague 3], so there's four of us and we just always talk about what we're doing. About what we're doing it, why we're doing, best way to do it, the most efficient way to do it … You saw for yourself, [name of colleague 2] coming in here, he is coming in here because he wants to show me this. And the amount of times we interrupt each other's lessons to drag the other one to show them what we are doing is embarrassing! (William).
>
> They may not always know why it has done it [worked] and they may not know the theory behind it, but they'll say to other teachers, try this (Paddy).

I would try it out and say to the kids what do you think? If it didn't work I might talk to other colleagues, to see if it worked for them, possibly in another way, that's fine, and if not, then we're onto the next new bandwagon (Grace).

Example 8.11: Representative participant comments on the importance of peer-to-peer dialogue in the testing out of new teaching initiatives

There was also evidence to suggest that such activities were associated with being a good educator (46 per cent of participants and 18 mentions). The excerpts in Example 8.12 from the interviews showcase this stance.

I do think that the most successful types of teachers do try-out and use different types of things and they are successful with regard to results (Penny).

I know of one or two people who I know are good practitioners and use some of the things they learnt on the [TEEP] programme, but they are innovative enough to put their own expertise and ideas into practice, alongside, or it's become absorbed in what they do any way as good teachers (Hannah).

Experienced teachers say, 'This is a good idea, or this is a good idea, try this.' I've learnt a lot from colleagues who are particularly good at certain things … and then you disseminate these ideas yourself (Steven).

Example 8.12: Representative participant comments on the association made between being a good educator and their propensity to try out new teaching initiatives

Indeed, not trying new teaching and learning initiatives out and sticking to the 'same-old-same-old' was thought to be the mark of a poor educator, as Audrey explained:

> Whereas other people I know, and I've seen it with my own eyes through an observation thing who will use the same techniques on two or three observations. Other people who get good or an outstanding will want to try something new because they want to see if it works or not (Audrey).

Moreover, as suggested in Example 8.12, there was a profound feeling amongst participants (eight and 16 mentions) that not only did good educators make strategies work, they also improved them. Miles conveyed this sentiment well:

> Well, we make things that don't work, work ... We've done it with a number already - we make them work. We kind of take something and we make it work … When the National Curriculum came out, it wasn't ideal, we made it work. There were different things coming out of SNS, and we made them work you know (Miles).

Regarding improving strategies, Grace suggested it was part of her make-up to make things work better. She also introduced the term adaptation in respect making a teaching initiative work, “If they work … you can do better … Whatever you’re given you adapt to suit your own way of doing things ... I adapted what was there”. Richard was another participant to express his behaviour in altering teaching initiatives as adaptation, “I mean you get loads of anecdotes, anecdotal experience and anecdotal learning all the time from your experiences with classes and you adapt that”. Seven participants (9 mentions) thought that there was no fixed way to implement teaching initiatives. Steven represented this mindset best thus, “Any organisation or training body or method which says, ‘This is how you should do it’, it really isn’t. There are no fixed or definite ways to do it”.

This concludes the section on Theme Five which has been about the exogenous factors that have led to the practitioner uptake and subsequent adaptation of some of the operational devices of brain-based education. I next summarise the full chapter.

Summary

In this chapter, the data have been analysed under five themes. In the next chapter which is focused on interpretation rather than analysis, I consider these themed findings in relation to the conceptual framework as documented in Chapter 2, 3 and 4.

Chapter 9: Interpretation and Synthesis of Findings

In the previous chapter, I presented the analysis of the data under five themes, namely:

- Theme One: Drivers not mechanics
- Theme Two: Memes, mechanisms, messages, and mayflies
- Theme Three: The persistent allure of gothic pedagogy
- Theme Four: Darwinian pedagogy
- Theme Five: Pedagogical engineers

In this chapter I offer an interpretation of the findings with reference to existing research (Chapter 4) and the theoretical literature from Chapters 2 and 3.

Chapter overview

Drawing on the relevant literature and developing my earlier adherence to Simons' (2009) conceptualisation, I commence with an examination of the concept of interpretation as it applies to qualitative inquiry. I next document how I have operationalised this particular understanding of interpretation. I have adopted a standard format to record the results of my interpretation of each of the five themes. Each theme starts with a short reminder about its naming rationale and its axiomatic nature. Thereafter, key findings from each of the themes are reconvened with the explicit purpose of developing an interpretation. After this I give a single summarised and overarching interpretation. I do not give mini-summaries at the end of each theme because I consider that a more powerful and cogent interpretation can be achieved by considering the five developing interpretations holistically. Stylistically, this approach will also make for a less repetitive read whilst allowing a more compelling narrative focused on telling the story of the data that ultimately addresses the research questions asked (see Figure 4.4). This is philosophically congruent with Denzin and Lincoln's (1994) assertion that a determining feature of interpretivism is its predisposition to story-telling and narrative over theory-building.

Data interpretation

The substantive purpose of this chapter is to report on the interpretation of that analysis. Following on from Chapter 7, after Simons (2009), I understand interpretation:

> to mean the understanding and insight you derive from a more holistic, intuitive grasp of the data and the insights they reveal. This may take into account understandings gained from formal analysis, but more emphasis is

> placed on retaining the holistic nature of the data through intuitive and hermeneutic processes than deductive or inductive analyses (p. 3).

Essentially, within the auspices of the social sciences "the art of interpretation" (Denzin, 1994, p. 500) is the transformative process (Wolcott, 1994) by which sense is made of what has been found out "does not tell a story. The researcher does" (Walker, 1980, p. 234). Interpretation has attracted a variety of depictions. An evocative one is dancing with the data (Cancienne & Snowber, 2003). More simply, Willig (2017, p. 276) describes it as "meaning-making" whereas Simons (2009, p. 5) frames it as "selecting meaning".

After being unable to find much guidance on how to conduct my interpretation of the findings in Chapter 8, I concluded that Patton's (2002) rather brutal and fatalistic pronouncement that "In short, no absolute rules exist" (p. 432) was a fair assessment of the state of the 'how to do qualitative interpretation' literature. Possibly, the relative paucity of guidance stems from the creative, innovative and above all intuitive nature of interpretation. As Bloomberg and Volpe (2012) caution, as a skilled cognitive process "Creativity is more difficult to distil and describe" (p. 180). This is because it invariably evolves after:

> total immersion in the data, re-reading transcripts, field notes, observations and other forms of data in the data set … [bringing forth] metaphors, imaging, reflective thinking, puzzling over incidents and observations, exploring alternative interpretations, angles of perception, seeing through different lenses, lateral thinking … [which] can incorporate contradictions, ambivalence of meaning and paradox (Simons, 2009, p. 4).

In my efforts to transcend the "factual data and cautious analyses and begin to probe into what is to be made of them" (Wolcott, 1994, p. 36) I have employed many of Simons' creative processes as I have moved backwards and forwards between the raw data, the analysis and the emerging interpretive story. With what follows, I have endeavoured to "Do [my] very best with [my] full intellect to fairly represent the data and communicate what the data reveal given the purpose of the study" (Patton, 2002, p. 432). Wishing my account to be an "interesting and readable report" I have attempted to provide "sufficient description to allow the reader to understand the basis for an interpretation, and sufficient interpretation to allow the reader to appreciate the description" (Patton, 2002, p. 503). Separate interpretations convened around each of the five themes follow next, commencing with Theme One.

Before proceeding, to fulfil one of my espoused personal values (see Table 5.1), namely that of transparency, I deal with two important limitations pertaining to the interpretation of the data collected and analysed that forms the substantive part of this chapter. Firstly, as indicated only selected key findings from each of the themes from Chapter 8 are reconvened with the explicit purpose of developing an interpretation. Practically, this is because this thesis cannot cover all the findings from every theme and ontologically, it is in keeping with my subtle realism stance (see Chapter 5): rather, I have sought to identify individual findings that appear to be important and that collectively enable me to proceed with making-meaning across the entire data and within the conceptual framework established in Chapters 2, 3 and 4. Inevitably then, some findings are not taken any further forward in terms of the interpretative process. Likewise, despite my care in Chapter 8 to construct the themes to avoid the overlap of data findings, the bounded separation of issues arising from the interpretation of that data has not been fully achieved. There has been some minor overlap of certain aspects of the interpretation across themes. In such instances, I explain my proposed treatment of the issue in question when it first arises. Secondly, and a direct consequence of the first point, it should be noted that one inevitability of the highly creative, innovative, and intuitive nature of the process of meaning-making is that alternative interpretations can be arrived at. If "meaning and interpretation are moments in time rather than fixed solutions" any interpretation should perhaps only ever be considered ephemeral (Brindley, 2015, p. 238). The compelling corollary of this lack of singularity of interpretation is that the one that I present in this chapter is only one of many possible interpretations that exist, either at the time of writing or at any later time. Indeed, it would be unwise of me to dismiss the potential that the data hold to facilitate other researchers' alternate readings of it. Although it is the product of a desire to create a compelling narrative that gives coherent and cogent answers to the research questions by telling the story of the data, inescapably, the interpretation that follows is simply *my* best current account of making-meaning with data that does not speak for themselves. I start my interpretation with *Theme One: Drivers not mechanics*.

Theme One: Drivers not mechanics

As previously noted, this theme is so named because of some in-vivo coding during the analysis stage. When asked about whether she thought it was important to know about how teaching initiatives worked, Kate replied that "I suppose it's only the same as a driving instructor being able to drive a car ... Understanding how the car works to be able to fix it if it goes wrong". Her response chimed with me as I remembered the phrase, indeed, one of Hook and Farah's (2012) respondents had given an almost identical answer. As I continued the coding Kate's position turned out to be unique. Nevertheless, I considered that with some modification the metaphor could capture the essence of the theme that covers practitioner's knowledge of brain-based education and its operational devices. This theme is about the findings that show how brain-based education impacted the knowledge of the practitioners, and how neuroscience research, putative and otherwise, had a negligible impact on their decision- making in relation to brain-based education.

I'm yet to be convinced

Grace's assessment that her own level of neuroscience knowledge was "In comparison to my Year 7… quite a lot … compared to a neuroscientist, very little … in comparison to the rest of the teachers in the school, about the same" was eerily prophetic. Not only did it capture perfectly the poor levels of participant neuroscience comprehension, it confirmed existing research (Alekno, 2012; Brevoort, 2012; Greenwood, 2006). The participants' cursory knowledge of neuroscience is perhaps initially explainable given their extensive and sustained exposure to brain-based education and its invocation of contested neuroscience (*see Theme Two: Memes, mechanisms, messages, and mayflies*). Dekker et al. (2012) suggest an eminently feasible reason why educators' neuroscience knowledge is so poor thus:

> teachers who have worked … for a number of years, will have been confronted with more information about the brain and its influence on learning, both correct and incorrect. Apparently, it is difficult for teachers to then differentiate between this correct and incorrect information (p. 6).

The poor levels of understanding extended to brain-based education and its operational devices (see Table 8.2), despite participants all professing to be familiar with brain-based education as an approach to teaching. Even though there were some science teachers in the interview sample, their knowledge was no better than the non-scientists. Paradoxically, many of them claimed historical and contemporaneous use of many operational devices (Figure 8.3) and likewise, many had received and given PD on many of its operational devices (Figure 8.2). It appeared inconsistent given the strength of these use and training claims that there was such a limited understanding of how these devices were supposed to work and the contested neuroscience behind them. Research on neuromyths/neuromyths+ suggested that the operational device that would be the most well understood was VAK theory (Alekno, 2012; Dekker et al., 2012; Howard-Jones et al., 2009; Rato et al., 2013). This was found to be the case, albeit it within the confines of the small cohort of practitioners who felt confident enough to venture an explanation. Research however did not fully predict the poor understanding shown for Multiple Intelligence theory, or indeed Brain Laterality or Brain Gym®. The discrepancy here most likely arises because I used an open-ended questioning approach to assessing levels of knowledge about a wider range of operational devices rather than the more favoured survey-based series of limited/closed statements about neuromyths used by, for example, Dekker et al. (2012), Howard-Jones et al. (2009) and Rato et al (2013).

The participants' explanations amounted to a "confusing hodgepodge of ideas" (Alekno, 2012, p. 151) in that they were characterised by a lack of lucidity and vagueness but there was no evidence to support the finding that the participants were incorporating aspects of psychology or cognitive science (Hook & Farah, 2012). The noticeable ambiguity that characterised the explanations given by the practitioners was consistent with other earlier inquiries where open ended questions about brain-based/neuroeducation/neuroscience were employed (Alekno, 2012; Brevoort, 2012: Greenwood, 2006; Hook & Farah, 2012; Rato et al., 2013; Whitehead, 2011). The mechanism proposed by Dekker et al. (2012) for poor neuroscience knowledge logically presents itself as a viable candidate explanation for the participants' poor knowledge of brain-based education and its operational devices. However, it is my contention that alternative accounts for this lack of understanding exist.

The first explanation has its origins in the designers' own explanations of the various brain-based operational devices. I have already explained that Smith (1996) elucidated Accelerated Learning as being "a series of practical approaches to learning … [based on] how the brain functions; motivation and self-belief; accessing different sorts of intelligence and retaining and recalling information" (p. 49). TEEP framed Accelerated Learning slightly differently as "a structured model for actively engaging learners in learning … based on research of brain function, student motivation and multiple intelligences and provides a platform for life-long learning" (TEEP, 2008, para. 2). Both explanations are ambiguous and not conducive to being easily recalled or indeed, understood. It is not surprising therefore that Leonora resorted to Googling Accelerated Learning to offer a coherent explanation of it during her interview. The originators' own explanations of the operational devices documented (Table 8.2) adopting Alekno's (2012) lexicon, could also be described as a confusing hodgepodge of ideas. With only these convoluted and awkward explanations to refer to, answering questions about what they are and how they putatively work was perhaps going to always result in muddled, vague, and inarticulate responses from practitioners. I next discuss the second candidate explanation, namely that the practitioners do not want to know about explanations of what brain-based education is or how it is supposed to work.

The practitioner's rejectionist attitude to neuroscience proved to be an antithesis to the consensus held about educators and their predisposition to it. Contradicting earlier research (Brevoort, 2012; Rato et al., 2013), the participants were not keen to find out about neuroscience (Grace's "It hasn't been one of my driving forces to find out how the brain learns or how it works"). Likewise, there was a stark contrast with research (Hook & Farah, 2012; Pickering & Howard-Jones, 2007; Rato et al., 2013; Serpati & Loughan, 2012) in that the participants did not recognise and were not enthusiastic about the potential of neuroscience to inform education. I did not find any evidence to support findings (Pickering & Howard-Jones, 2007; Hook & Farah, 2012) that the practitioners were keen to be active partners in the development of the field of neuroeducation. Not only do these separate results disrupt empirical findings, they call into question dominant assertions in the opinion-based literature. Consequently, hypotheses that educators have immense goodwill to neuroscience and are keen to reap the benefits of neuroeducation for the benefit of their students (Goswami, 2006) and that they are enthusiastic for information about the brain (Geake, 2004) are surely thrown into doubt.

Similarly, the swell of voices from both sides of the divide that call for educators to have instruction on neuroscience (e.g. Baylor, 2000; Fischer et al., 2010; The Royal Society, 2011) are likely to be disappointed by the practitioners' close affinity with Alekno's participants for whom "An extensive understanding of the brain's functioning did not seem especially significant" (2012, p.153). Grace's "It's all very interesting, but it's never really made me feel, if I knew more about this I could be a really effective teacher" evidences how the practitioners largely rejected neuroeducationalists' submissions that they become proficient in neuroscience knowledge to improve their teaching (Rato et al., 2013). Besides, since they did not, as I discuss in Theme Three's *Hearts and Minds,* succumb to the dazzle of neuro, I suggest that the participants were not neurophiles (Smeyers, 2016; Trout, 2008) per se. However, nor were they overtly neurosceptic. Rather, my assessment based on the evidence is that they were ambivalent perhaps to the point of being 'neurodiscounters', their dispositions and decision-making about brain-based education (and neuroeducation) were firmly predicated on matters beyond neuroscience knowledge and its assumed scientific, or indeed cultural authority. Ultimately then, in the narrow, and as I have argued, contested conceptualisation of neuromyths as knowledge, calls for neuromyths to be "erased from the minds of educators" (Goswami & Szűcs, 2011, p. 115) are somewhat redundant because the practitioners never acquired any significant degree of neuroscience knowledge.

As a profession, we are not academics

The findings showed that the participants were not particularly research-engaged. Penny's "Because as a profession we are not academics" exemplified the ardent feeling that it was well beyond practitioners' job remits to seek out scholarly knowledge, become educational theorists, or indeed educational researchers. Participants' concerns relating to the desirability of acquiring neuroscience knowledge, and indeed engaging with academic educational knowledge more generally, were negated by more pressing day-to-day issues, most typically lack of time (Richard's, "If everyone had to be an academic about education, I don't think that's sustainable … and be a practising teacher"). This finding firmly replicated Greenwood's (2006) results and is also congruent with assessments that the prevailing neo-liberal policy ensemble and its "conjectural initiatives" caused educators' workloads to dramatically increase (Jones, 2016, p. 160). The finding that the practitioners felt that it was too difficult to understand academic research, even if they found the time to find it (Audrey's "If I have to sit and read why it works, I find that difficult") however seems to be different since no other studies have produced data to this effect. Whilst it possibly reinforces the view that neuroscientists tend to patronise (Anderson & Della Salla, 2012), the practitioners' admission that academic research is typically too hard to understand would support views in the neuroeducational community that the technical and specialist nature of bona-fide neuroscientific material makes it too difficult for educators to comprehend (Hardiman, 2010; Sylvan & Christodoulou, 2010). The prior result that practitioners do not really want to know about brain-based education or indeed how it is supposed to work could be one of the reasons why the practitioners' knowledge of it was so poor. Indeed, when framed in this way, why would educators want to invest the scarce resource of time on something that is difficult to access, conceptually challenging and is perceived as somewhat of an irrelevance?

Although it is framed beyond the parameters of brain-based education, Richard's assertion that educators *should* want to know more about academic education research and that intermediaries could bridge the divide between educators and researchers demonstrated some like-mindedness with neuroscientists who also called for intermediaries (e.g., Hardiman, 2010; Sylvan & Christodoulou, 2010; Fischer et al., 2010). Notably, there are close parallels here between the proposed educational engineers or translators of Fischer et al. (2010) and Richard who believed there was "a role … for people … to understand the theory, to be better at applying the models in the classroom and trying to facilitate that evidence-base into practice". In the greater scheme of things, Richard's position is only interesting because it is unique within the data and its close resemblance to one of the dominant themes in the neuroeducational literature. In term of the broader conclusions of this project it should be discounted. Certainly, there is no data at all to support the more advanced idea of neuroeducators i.e. specialised teachers who have qualifications in neuroscience and teaching that has been advocated by many (e.g. Ansari and Coch, 2006, 2012; Ronstadt & Yellin, 2010; Stein et al., 2010). By the same token, nor have I found any data that suggests practitioners would be favourably disposed to teach in research schools modelled on teaching hospitals (e.g. Coch et al., 2009; Fischer et al., 2010; Ronstadt & Yellin, 2010) where they would engage with bona-fide neuroscience knowledge, develop and apply effective neuroeducational models of practice.

Taking the data discussed to this point into account, on the matter of "how, where, when, and at what level to educate educators about the neurosciences" (Coch et al., 2009, p. 28) there was a clear signal that the practitioners were of a wholly different mindset in terms of the attractiveness and suitability of the propounded medical/scientific model. Whilst this practitioner stance on the rejection of the medical /scientific model of teaching hospitals is fully congruent with their ambivalent stance on neuro-knowledge acquisition *(I'm yet to be convinced)*, it also perhaps speaks to the feelings of the wider teaching work-force on the broader issue of the unification of research and practice as represented by the recently resurrected evidence-based practice movement. It was intriguing to find out that practitioners adopted this position, as it appears to run contrary to the contemporary policy appetite for the creation of an educational science built on the supposed more successful scientific model (Wiseman, 2010). Based on the evidence so far, my conclusion is that the practitioners were measurably academic research averse (Ansari, 2008) and possibly even academic research avoiders (Samuels, 2009). I continue to develop the discussion about EBP in *I need it now, I need something that works* in the context of the finding that the practitioners were drawn to models of practice that worked.

Prima facie acceptance

To compound their ostensible research-disengagement, practitioners were also largely of the belief that it was not their responsibility to personally investigate any claims made in regard to any new teaching initiative's impact or research underpinning and this position subsumed brain-based education. There were two sets of rationalisations evident in the data. The first was exemplified by Paddy's "[I] trusted Gatsby to do all the checking out so that it was OK to use". The second rationale was represented by Penny's "If they get told something … they just said that's right … OK, fair enough". The practitioners took the view that in the first instance, the organisation or the individual who owns/sells/creates the educational initiative have an obligation to present content and claims that were valid, trustworthy and reliable. In situations where initiatives were instituted/introduced by others, as was the case with TEEP's Accelerated Learning and its operational devices, they found a second line of defence in the status and reputation of those bringing TEEP to their attention - as exemplified by Audrey's, "So it was almost like [names of TEEP trainers] had done the research for me". Once past the front door of the school or LA, the practitioners felt it was not their role to question the impact-based or research-based claims of the operational devices but to initially take them at face-value. Both rationalisations hinged on the idea that responsibility for confirming claims lay with others. In relying totally on the say-so of privileged others, I suggest that the practitioners acknowledged that these others were specific instantiations of what Ball (2017) termed cultural heroes. Moreover, in that they were educational managers or leaders who were successful in constructing a pedagogic culture in pursuance of 'corporate' objectives, I contend that they could be envisaged as pedagogic variants of cultural heroes.

To develop this finding in detail, for which there is no equivalence in the empirical literature, I suggest some plausible explanations, all of which are likely to have applied concurrently as their aggregated genesis is in a consideration of the "new values, new relationships, and new subjectivities" (Ball, 2017, p. 48) that characterise the English education system. Firstly, finding themselves blamed for poor standards (Reay, 2006), the practitioners' actions in avoiding any 'personal due diligence' allowed them to purposefully remain in the dark about the veracity of claims. Thus, in a high-stakes accountability system where the attribution of fault for underperformance could be construed as the lubricant that facilitated the smooth operation of the system, they were advanced an expedient shield of deniability and thus culpability - "Hey, *you* made those claims, not me". Indeed, in the prevailing blame-culture (Audrey's "If they don't get their

C grade … is it their fault? No – it's our fault!"), the prospect of redirecting blame for any failure of brain-based education to improve standards back to its introducers/creators/vendors must have been inordinately appealing and reassuring. To tentatively theorise these data, as those only delivering the services, the practitioners' actions here could be viewed as an active de-coupling of themselves from those who possessed the strategic power for the related policy decisions (Cutler, 2015). Secondly, the impact of sustained functioning as mere technical-rationalist implementers (Bottery & Wright, 2000) where their terrain "for action [was] constrained by… dominant policies of standards, attainment, and accountability" (Maguire et al., 2013, p. 333) rather than as autonomous professionals replete with the skills to exercise major input on the policy decisions about curriculum, teaching methods, assessment and school management (Bottery, 2000) could have been to deprive the practitioners of their faculties of independent agency, specifically the ability to exercise discrimination and criticality. Indeed, as Pollitt (1992) notes the doctrine of managerialism requires its labour force to be instilled with unquestioning adherence to corporate aims. Thirdly, operationally rather than strategically central in a government framework of priorities defined by an array of directives and incentives (Jones, 2016) characterised by obfuscation and opacity but nevertheless intent on reconfiguring the teaching process (Davies, 2015) it is possible that they became accustomed to relying on others to generate, introduce and recommend innovative models of practice. Somewhat similarly, this may have contributed to practitioners' sense of learned helplessness causing their ability and inclination to exercise a priori challenge to be dulled or even blunted entirely. This last conjecture brings into play the possibility of pedagogical gaslighting, a concept that I introduced in relation to Ofsted (see Chapter 3). Since the potential applicability of pedagogical gaslighting is invoked in the coming section *Hearts and Minds,* I reserve my main discussion of it until then.

I have already made the point that the practitioners did not countenance any expectation that it was their role to challenge claims made to them during unsolicited introductions to new models of practice. The practitioners' ready admission that they accepted brain-based education's putative neuroscience at face-value was a specific instance of this very clear and novel finding. Although not reflected in terms of the extant empirical research (see Chapter 4), the practitioners were not alone in adopting an accepting approach towards brain-based education's supposed scientific provenance. They were joined by many other fervent brain-based educationalists who have already unquestioningly adopted second-hand accounts of neuroscience (e.g. Hoiland, 2005;

Morris, 2010; Shepard, 2012). Furthermore, as also noted before, the LA hierarchy, the architects of TEEP and as I will discuss later, many other influential and active propagators and advocates of brain-based education's materiel also appear not to have undertaken any corporate due diligence (or otherwise) regarding the putative neuroscience underpinning brain-based education. While the reasons already proffered could account for why the practitioners would not be predisposed or have the resources to fully 'claim-check' brain-based education, notwithstanding the busy and consuming nature of their day-jobs, such arguments do not stand up for the myriad researchers, organisational users or indeed designers of brain-based education that feature in the testimony of the practitioners. It could be concluded collectively, but cautiously, that the actions of the practitioners feed into the meta-narrative that education too readily welcomes the latest ideas (OECD, 2007) because it is unable and /or unwilling to effectively scrutinise scientific research (Goswami, 2006; Howard-Jones et al., 2009, Jorgenson, 2003).

At this point it is perhaps instructive to re-examine the last point about the appeal of impact-claims in terms of knowledge, as ultimately that is what this theme is about. One objection to brain-based education was that it subjected students to unproven teaching methods (Davies, 2000). This appears to be at odds with the practitioners' keen interest in and reliance on being told that the opposite is true. Indeed, Miles's impassioned plea that all new teaching initiatives should be "evidence-based and … have an impact" captures the underlying sentiment that of chief concern to the practitioners was the need to maximise student academic outcomes. It also illustrates how, by construing the construct of evidence-based entirely as school improvement metrics, rather than as evidence that has been generated by scientifically orientated research that is rigorous and credible by scholarly standards, they are eschewing scientific knowledge in favour of user-generated, everyday assessment knowledge – school generated knowledge - in the form of the KPIs that were required to satisfy the demands of the twin policy technologies of managerialism and marketisation. Unfortunately for neuroeducationalists, the practitioners seemed unconvinced by "the need … to understand that MBE … must be based on careful and critical evaluation of rigorous and peer-reviewed research" (Coch et al., 2009, p. 28).

As I have already revealed, the practitioners found such research cognitively challenging, time consuming and difficult to find but a complementary explanation is also perhaps that the practitioners were more familiar with and had a better understanding of school-generated knowledge. As I shall show in *Theme Three: The persistent allure of gothic pedagogy,* the credibility and magnitude of the impact-claims became central to the appeal of brain-based education, allowing practitioners to judge its potential to work in their own settings. Besides, too much scepticism, as James observed, if orientated towards the claims offered for any new teaching models of practice, including brain-based education, would impede educators' decision -making processes about whether to proceed with trialling the initiatives. So, for the multitude of these reasons it seems, the impact-based claims in regard of brain-based education were duly accepted. To conclude, tentatively based on all the data examined in this theme, I might cautiously agree that the practitioners rejected knowledge about neuroscience and brain-based education because their exercise of judgment about the relative merits of the knowledges they were exposed to was entirely framed within their existence in a domain where policy-defined classroom needs were privileged. Ultimately, any knowledge that did not directly correspond with contributing to the "metrics of accountability" (Ball, 2003, p. 223) was perceived to be "knowledges inadequate to their task … naïve knowledges … disqualified knowledges" (Foucault, 1980, pp. 81-82).

In the next theme, I build on the discussion about impact-claims as a key influencer in terms of practitioners' disposition brain-based education to examine how, and how frequently, the practitioners acquired their knowledge of brain-based education.

Theme Two: Memes, mechanisms, messages, and mayflies

Although a meme is now synonymous with a trend or fad that is transmitted rapidly by the internet or social media, when it was originally conceived by Richard Dawkins (1976), he meant it to exemplify the cultural inter-human transmission of ideas, behaviours, or styles. Using Dawkins' conception of a meme, brain-based education and its operational devices became akin to a meme/s, in that for some time they were transmitted repeatedly and relentlessly through Westford as normative pronouncements about teaching. This theme is about the practitioner's exposure/s to and the transmission mechanisms and messages of brain-based education.

Mechanisms

Given that all the participants had participated in TEEP PD, the finding that the principal mechanism for acquiring a detailed and working knowledge of brain-based education and its operational devices was principally through formal face-to-face PD sessions was not unexpected. In this regard, it was very consistent with empirical inquiries (Alekno, 2012; Greenwood, 2006; Pickering & Howard-Jones, 2007). Nonetheless, where this result differs is that firstly, no study reported that their participants had acted as transmitters of brain-based PD in the local "educational space" (Jones, 2016, p. 135). Although this mostly occurred because the TEEP model of PD dissemination privileged its own accredited trainers, nevertheless in Westford, this constituted a new and important transfer mechanism that arguably further contributed to the diffusion and uptake of brain-based education. Indeed, I have already contended that these local trainers acquired the status of pedagogic heroes. This result breaks new ground as no studies produced data to this effect. Secondly, no previous research attempted to examine the types of PD experience in detail. I undertake this exercise next.

I have classified the two types of transmission as firstly *Passive Transmission*, and secondly, *Active Transmission*. Passive Transmission is so named because the participants obtained their knowledge through being typically, a recipient of PD, although not always, as I discuss later. Active Transmission involved the participant replicating that knowledge in an onwards transmission mode to others. Passive Transmission accounts for most of this study's findings on the transfer of knowledge about brain-based education and its operational devices. One of the most striking findings of this research was the emotive and effusive way in which the participants who had experienced Passive Transmission in the guise of TEEP-without PD recalled those encounters. Universally, the participants talked about the slick and wonderful PD sessions led by gurus and how the activities were fun yet challenging. Perhaps most importantly in terms of their subsequent dispositions to brain-based education, they were left with a warm, fuzzy, enthused feeling (Audrey's, "Oh, it's wonderful" and Steven's "Yes, yes, yes!). These findings are corroborated by Pickering and Howard - Jones' (2007) conclusion that brain-based PD was "often presented by individuals who… had developed their dissemination style to be memorable" (p. 112).

David Moffatt was identified by the participants as their primary brain-based Active Transmitter. It was surprising to find that even in a small and local sample as constituted by Westford LA, Moffatt had acquired an impressive 'pedagogical constituency' in terms of TEEP-without brain-based PD. As testified to by the practitioners, the ingredients of personal charisma, professional confidence and the skilful selection of dynamic, progressive delivery methods that reminded the trainees of what it was like to be a student (Suzanne's, "Fun, hands on and made you think") selectively coupled with a sprinkling of opportunities to facilitate the affirmation of existing practice (James' "It was sort of a re-affirmation of some of the things I'd always believed in and occasionally remembered") combined to form a potent PD experience confirming suppositions that exceptional communication skills (Sharp et al., 2009) clearly played a significant part in the widespread dissemination of Accelerated Learning and its constituent operational devices. The practitioners' accounts of their TEEP-without PD encounters uphold the wider neuroeducational concerns that respectively, inspirational, visionary, and enthusiastic selling methods (Goswami, 2006; Jorgenson, 2003; Corbalis, 2012) were employed by brain-based developers. On first inspection, these data are supportive of wider neuroeducational concerns that educators were indeed passive recipients of a campaign orchestrated by professional educationalists bereft of scientific credentials (e.g. Coch & Ansari, 2012; McCormick, 2000). Thus, on this premise, neuroeducational assertions that brain-based education had duped educators and exploited their enthusiasm perhaps should not be readily dismissed (Hardiman et al, 2010: Della Sala &Anderson, 2012).

Nonetheless, as seductive as this interpretation is, there is an alternative understanding to be explored. When Scott (1996) predicted the rise of "entrepreneurs for the system" (p. 104), he was perhaps more focused on classroom-facing educators responding to the demands of marketisation within the educational system. Nonetheless, the same environment, especially with the privileges it afforded innovation (Lubienski, 2009), has likely created the conditions that have given rise to brain-based education entrepreneurs and allowed them to prosper. Perhaps it is no coincidence that brain-based education arrived on the English educational scene immediately after the market-orientated reforms of the late 1980s (Exley, 2012) whereby education was commoditised (Ball, 2017) and the economic gospel of consumption flourished (Rifkin, 1995). However, David Moffatt and other Accelerated Learning developers and disseminators were not regarded by the literature as pedagogical innovators, and as such, natural products of the prevailing policy technology of marketisation. Nor were they perceived as pioneers who had developed PD products which had transcended their dubious scientific provenance to become leaders in a competitive consumer market inhabited by educators who had adopted the mantle of skilled/privileged choosers (Gewirtz, Ball, &

Bowe, 1995). There was some limited recognition in neuroeducational circles that such brain-based names were entrepreneurs, if only unscientific ones (Howard-Jones et al., 2007) and even that brain-based education had been marketed (Dekker et al., 2012) but these assessments were nearly always subordinated to the prosecution of the neuroeducational scientistic agenda. Nonetheless, the data suggests that the success of Passive Transmission, particularly as represented by TEEP-without PD was twofold. Firstly, its designers displayed entrepreneurial prowess in identifying a gap in the market equating to what the practitioners wanted to fulfil the system's wants (Lyotard, 1984) and then harnessing albeit, contested, research to skilfully formulate and market models of practice disseminated through appealing PD, that in principle at least, claimed to deliver on these hitherto unsatisfied wants. In terms of the latter, the brain-based entrepreneurs skilfully created coherent PD experiences that were effective at inviting change because they also had a sophisticated understanding of what the practitioners would find engaging. They were able to model teaching behaviours that had practical and affective saliency and thus were able to convince the practitioners that the brain-based model of practice, or at least those elements that they modelled would work in their classroom. On the former, a possible interpretation is that brain-based education is a fabrication, a façade, a skilful but misleading translation of complex neuroscience into something simple that is promoted as "objective and hyper-rational" (p. 217) and is thus an inevitability of Ball's (2003) technology of performativity.

With all participants professing to have heard of it, the penetration of brain-based education, notionally in the guise of a meme seemed to be more advanced, even across mainstream educators than had been found (Pickering & Howard-Jones, 2007). This data displays internal congruence in that this finding is consonant with the very high levels of awareness found for many individual operational devices. Previous studies suggested that VAK theory was the only operational device to elicit levels of recognition nearing 100 per cent (Alekno, 2009; Dekker at al., 2012; Howard-Jones et al., 2009; Rato et al., 2013) - the findings of this study replicated these findings. The relative levels of recognition professed for Multiple Intelligence theory, Brain Laterality, and Brain Gym® also ostensibly mirrored the empirical evidence of Alekno (2009), Dekker at al. (2012), Howard-Jones et al. (2009) and Rato et al. (2013). The extensive levels of awareness found by this inquiry for Accelerated Learning, Enriched Environments, Mind Mapping and the Mozart Effect, however, appear to be without any empirical parallels. The most probable explanation for this last set of new findings is that they were included in TEEP PD meaning that they were specifically asked about, as opposed to previous studies, where for contestable reasons already discussed they were excluded from research instruments.

Messages

Even as early as 2003, Rose had advanced the idea that the dispersion of brain-based education was not just confined to education, contending that it had even penetrated government and its agencies. The findings that I discuss next uphold his speculation. Passive Transmission via PD was typically the main mechanism for detailed knowledge transfer, and some knowledge transfer certainly occurred through the mechanism of Active Transmission, but the findings strongly point to a second type of Passive Transmission. Encounters such as these were differentiated by being not so concerned with *new* knowledge transfer per se, but what amounted to a compelling, normative 're-presentation' of that knowledge by educational agencies charged with improving the standard of teaching in Westford's operational environment. The inclusion of brain-based material in the school-facing literature, or "performative texts" (Ball, 2003, p. 224), of these educational agencies is likely to have contributed to the onward transmission of the meme of brain-based education. This a noteworthy point, since it highlights that individual educators were not the only ones to succumb to the appeal of brain-based education. However, the involvement of educational agencies seemed to go beyond simple replication of the brain-based meme. Maybe somewhat more importantly, it seems that by giving brain-based education an official platform and including it in official conversations about improving teaching efficacy, they elevated its importance in Westford to that of a legitimate and authoritative approach to teaching. This perhaps contributed to the proclivity of participants to accept its knowledge claims at face value. As yet, this result is without direct empirical replication. Certainly, while Alekno (2012) observed that PD was *the* source by which her educators encountered brain-based education, she notes that thereafter there was no evidence of district, state or central government initiatives around the propagation or embedding of brain-based education. Consequently, and in direct contrast to the findings concerning Westford LA, she concluded that "Overall, subscribing to neuromyths and practicing neuromyths in the classroom was largely an individual effort" (p. 155).

Individually, SNS, GTP/ITT providers, the LA and TEEP had only indirect control over what practitioners did in the classroom because although they were central to the "impact agenda" (Wisby, 2016, p. 1), they nominally only operated in an advisory capacity. It was beyond their powers to instruct or direct educators, or indeed schools, how to organise and deliver teaching but nonetheless they exerted “mechanisms of target-setting, resource allocation, programme specification, training, audit and inspection [that] penetrate[d] deeply into the everyday procedures of educational institutions and the life-world of those who work … in them” (Jones, 2016, p. 169). These educational agencies, as localised versions of Ball’s (2003) powerful agents were able to transcend the parameters of autonomy because they collectively and pervasively were able to pronounce on what constituted best/good practice. By framing and promoting brain-based education as an efficacious model of practice they propelled it into the realms of the visible and normative. Their repeated use of its operational devices within their educator-facing operations and paraphernalia served only to extoll the virtues and benefits of brain-based education. The conjunction of these synchronous and recurring secondary types of passive encounters supplemented and authenticated the primary PD encounters and likely raised the status of brain-based education even more. Moreover, the involvement of practitioners themselves in the Active Transmission process is also likely to have been complementary and additive in regard of the dissemination of the compelling message system. In short, like biological memes, this ‘pedu-meme’ (i.e. a normative idea about teaching) travelled both longitudinally down and horizontally across structures and individuals. I would not wish to exaggerate by likening the situation to that of a hysterical contagion, but certainly, for a duration, the result of these actions I suggest, was a substantial amplification and reinforcement of the brain-based meme in and around Westford. In short, these agencies divested practitioners of the semblance of autonomy over judgments about what models of practice to deploy to maximise academic outcomes.

The data revealed that the message system, other than that of the content of brain-based comprised of four main messages. The large numbers of participants that attested to the receipt of each of these individual messages signals that there was seemingly very little “memetic drift” (Dawkins in Blackmore, 1999, p. xiv) i.e. the four messages were transmitted without any distortions or errors. These were, firstly, that brain-based education was brain-compatible and, secondly, that it was based on uncontested neuroscience. The third message was that brain-based education was best/ good practice and the final and perhaps most important message was that it improved academic outcomes. In his foreword, Dawkins, writing about gene transfer believes that in natural science whilst individual genes are selected against the background pool of genes, groups of genes that are mutually congruent do better (Blackmore, 1999). He calls such groups of co-adapted meme complexes ‘memeplexes’ and suggests that not only do they do better, they are hostile to rival memeplexes. Dawkins maintains that "selection has chosen them as a group, but because each separate member of the group tends to be favoured when its environment is dominated by the others" (p. xiv). Developing these ideas further, I put forward the interpretation that these four messages together with the detailed content of brain-based education constitute a memeplex. I suggest that this pedagogical memeplex, mainly through successful i.e. fecund replication, came to hold the practitioners in a state of temporary pedagogical captivity. During its hey-day, as discussed in the next sub-section, the data show that practitioners were unable to escape from a latticed-web where brain-based education – its four messages and content, and assertions about its legitimacy and status – inexorably bombarded them from seemingly all directions. As William highlighted, the effect of this was that some educators found that this (over-) exposure to brain-based education caused them to be blinkered or even hostile to other models of practice, "Right, we've been given this, it works, it's brilliant … you're looking at something else, we've not been given that, that's not very good, you shouldn't be doing that (William). Assertions that they resembled prey (Hook & Farah, 2012) seem inadequate to me to describe this feature of the data.

In *Mechanisms* I initiated conjecture about how widespread the phenomenon of brain-based education had become across education. To conclude this sub-section, I now use all the evidence examined up to this point in this theme to re-examine the speculation about the supposed mechanisms involved in this diffusion. The hegemonistic view was that "A fast commercialization has led to a spread of these programs into classrooms around the world" (Dekker et al., 2012, p. 2). On the contrary, the data that I examined suggest that such simplistic assertions do not even begin to capture the reasons why brain-based education diffused to such a breadth and depth across Westford. Rather, the data convincingly show that the process of diffusion was altogether more nuanced, complicated, and wide-ranging than neuroeducationalists supposed. There certainly was an initial commercial element to the diffusion of brain-based education in Westford, most notable in the form of the pre-TEEP-without PD, but the theorising fails to take account of the localised network of connections that served replicate with astonishing fecundity and fidelity the memeplex of brain-based education. The driver influencing the ensuing 'organic' replication was not commercially orientated. Far from it, these were powerful agents (Ball, 2003) intent on system change both at the level of the individual classroom and below. Based on this, I contend that neuroeducationalists should re-evaluate what I believe are their own privileged neuromyths, which is in this case is the presumption that it is *only* the commercial route that has caused brain-based education to proliferate. In Westford LA the reality was considerably more complex, messy and organic and subsumed within the indefatigable influence of the three interrelated policy technologies.

Mayflies

Mayflies are a group of aquatic insects that are famed for their very short lifecycle. The scientific name for the group is Ephemeroptera, derived from the word empheral which means fleeting, transitory and impermanent. I consider that discussing brain-based education under the metaphor of mayflies is quite apt given the study's findings that are highly suggestive of it being "another 'trendy' initiative" (Jones, 2004, p. 43) whose trendiness has or at least is expiring rapidly.

The overarching feeling amongst participants was that brain-based education, along with its operational devices, had become "Last week's best flavour" (Hannah). In the pre-TEEP period, it appeared to enjoy substantial popularity, being in the words of Audrey "*The* thing to do". Although it is difficult to put a time frame on when brain-based education started to become "old hat" (Michael), it is clear from the participant comments that by the time TEEP had been adopted as *the* school improvement tool of choice by Westford's senior LA staff (circa 2008) and was therefore "at large" in the authority as quasi-compulsory passive PD, they already possessed capability in brain-based education having, in many cases, an established history of often multiple Passive Transmission encounters. The data presented in Chapter 8 demonstrated that a fatigue effect was evident as participants explained how their interest and enthusiasm for brain-based education had dwindled over time, eventually almost fully subsiding, being practiced in name only and even the only with a small number of operational devices. The participants implicated two factors in the demotion of brain-based education as one of their favoured teaching models of practice. By the time of data collection, it was very clear that the participants collectively considered that the hitherto substantial structural, especially PD, support network for brain-based education had atrophied. This included that both beyond and within the LA support. Of these, the within-LA support TEEP was the latter of the two support systems to go. When in 2011-12 the LA's budget contracted severely because of the incoming Coalition government's tight fiscal control, it appears that TEEP was found to be an old, expended initiative that no longer enjoyed the political and social capital when it was invoked as the saviour of the LA's performativity woes.

Outside the LA, "conjunctural initiatives" (Jones, 2016, p. 169) like SNS who had hitherto championed the brain-based cause had also suffered the same fate in a system geared up to "short-term horizons" and an impatience for rapid results (Jones, 2016, p. 149). In the UK, Smith, *the* key brain-based name, proactively began to distance himself from Accelerated Learning, for example, claiming that he had, "moved on, the science has moved on" (Revell, 2005, para. 32). Additionally, many of the LAs who were high-profile and active champions of brain-based education (e.g. Cheshire), like Westford, were engaged in a battle for survival. This was because the then Secretary of State for education had invited the headteachers of all successful schools England (in terms of Ofsted inspection outcomes) to convert, on a fast-track, to Academy status. LAs in England were faced with the serious prospect of losing control of many of their schools which meant that their own viability was at stake. The consequence of this was a substantive refocusing of Westford LA's attention onto the salient matter of the prospective academisation of its eligible schools. The cumulation of these factors seemingly sealed brain-based education's fate as educational ephemera. Jensen's prediction that "Brain-based education is here to stay (2008, p. 417) appears to have been somewhat precipitous given its apparent ultimate marginalisation as a generic standard model of practice.

In this theme I have interpreted the data that speaks to the practitioners' exposure/s to and the transmission mechanisms and messages of brain-based education. In the next theme I develop the data that relates to the appeal of brain-based education.

Theme Three: The persistent allure of gothic pedagogy

Gothic pedagogies were conceived as being models of practice that have no basis in accepted knowledge and thereby act as disruptors of the status quo. The term is used much like the early medieval original users in a pejorative way, critiquing the then new, unclassical, and much derided architectural movement sweeping across Europe. On this basis, I propose that brain-based education is a gothic pedagogy in that it is 'rude', an unfounded usurper and disruptor of existing models of practice that is, in some quarters, disliked, derided, and discouraged. Thus, this theme is about the reasons why practitioners were attracted to brain-based education and why as effective educators they were impelled to constantly search for metaphorical Holy Grail of teaching, even if it meant that they were then at risk of adopting putatively unscientific teaching initiatives.

The allure of a gothic model of practice

Collectively, the practitioners gave a lengthy and comprehensive list of reasons for why they or other Westford educators found brain-based education appealing. For them, brain-based education fell into the *Love it!* category of teaching initiatives. I have summarised and analysed their reasons in Table 9.1. What is immediately notable by its absence from the list of reasons, is any mention of the idea of neuromania (Legrenzi & Umilta, 2011). This putative allure had seemingly gained the status of an accepted truth in the theorising about why brain-based education was an attractive proposition for educators (e.g. Anderson & Della Sala, 2012; Ferrari, 2011; Howard-Jones et al., 2009). It is likely that encounters with brain-based education featured accounts of psychological and behavioural phenomena where neuroscience was selectively and marshalled for the explicit purpose of fostering neuro-corroboration with the sole aim of inflating its appeal to practitioners: it is thought-provoking to consider that the seductive allure of what was allegedly purported to be neuroscience does not feature in practitioner's rationales of their attraction to brain-based education (see Table 9.1). Conversely, by and large, the practitioners duly accepted these fake neuroscientific interjections at face-value (see Theme One). As I have shown, their neuroscientific knowledge was poor and together both findings are consistent with the data of Weisberg et al. (2008).

Table 9.1: List of reasons given by practitioners for their attraction to brain-based education

Why brain-based education appealed to practitioners	**Category**
They saw good teachers demonstrate it effectively	Functionality
They believed it was best/good practice	
It was a flexible approach	
It had applicability across the curriculum	
It was easy to understand	Expediency
It was easy to implement	

Why brain-based education appealed to practitioners	Category
It was well resourced	
It filled an ideas vacuum	
It helped explain why teachers were good or bad	Explanatory
It helped explain their personal learning experiences	
It helped explain their student's preferences, behaviours, and learning difficulties	
It had the "Wow!" factor	Hearts and Minds
As a good idea, it was something for them to believe in and get behind	
It was an innovative and pioneering approach	
It was perceived as being created for teachers	
It gave them a unique selling point	Personal
It supported their professionality	
It improved their career prospects	

As Table 9.1 demonstrates, and consistent with my interpretation in Theme One (I'm yet to be convinced), the mainstay of the appeal of brain-based education was grounded in the practicalities of being an educator rather than being seduced by the 'racy' or dazzling effect (Keehner & Fischer, 2011) of the (purported) neuroscience. I suggest that the reasons attributed can be analysed into five categories namely, Functionality, Expediency, Explanatory, Hearts and Minds and Personal. Preserving this order, I deal with each of them in turn.

Functionality

Under this heading, practitioners' reasons for the attraction bifurcated into the overlapping notions of utility and efficacy. Firstly, the set of responses unified by references to its flexibility and its applicability suggest that brain-based education appealed to practitioners because they judged it to be a model of practice that would be, and indeed was useful. The appeal of utility is significantly imbricated with what is discussed in *Theme Four: Darwinian pedagogy* about how the participants used brain-based education. As I show there, notions of flexibility and applicability, perceived and actual, are central to the detailed considerations of utility. To avoid duplication and to ensure a holistic interpretation, I subsume the remainder of this discussion within Theme Four. It is salient to make a methodological interjection before I move on to discuss the second reason. The result that brain-based education was found to be in part appealing by virtue of its utility originates from practitioner's responses to a direct question about appeal. These responses showed a close correspondence with the practitioner answers to a separate question about why they used brain-based education. The triangulation afforded by the consistency of the two sets of responses support, I suggest, the reliability of this finding, and by implication, that of the findings that relate to practitioner use.

The second set of reasons relating to brain-based education's appeal grounded its perceived efficacy also separated into two. These were that practitioners had personally observed good educators using brain-based education to a favourable effect, and secondly that they believed that it was best/good practice. In terms of the former reason, one compelling and somewhat unexpected finding was how for most practitioners, the attraction to brain-based education stemmed from seeing it in action with colleagues whom they believed to be successful and moreover that they genuinely seemed to respect and aspired to be like. I found it intriguing firstly that an appeal was generated by face-to-face observations of near-peer using brain-based education to favourable effect in real-time, real-environment teaching situations. Secondly, I was surprised that that the strength of this appeal appeared to be amplified when the students were perceived or known to be difficult and/or the school was in challenging circumstances (Michael's "The most cynical 'I'm not doing that type of teacher, you put them in front of a superb teacher. It's no good talking or showing them a video. Even when you say it's a school in very difficult circumstances they just say, 'So what?' You put them physically there and most say 'Wow!"). Michael aptly summed up the sentiments that even the most cynical teacher in Westford could not remain completely impervious to the appeal of a seeing a respected fellow teacher using brain-based education to superb effect and then want to try it for themselves.

This result did not feature in any prior research and as such it appears to be novel. Its real significance perhaps lies in its ability to empirically demonstrate the powerful impact on the uptake of brain-based education that a live, accomplished, and successful teaching performance by a fellow educator had, where the various operational devices were skilfully deployed to overcome perceived shared context and their concomitant challenges. The practitioner's identification with, or relatability to, the accomplished user of brain-based education also seems to have been a key factor in establishing its appeal. The practitioners' comments invoked the powerful and persuasive feeling of empathy with the context of the performance i.e. challenging students in a performative context. The practitioners recognised that teaching challenging students and/or teaching in schools that are struggling with academic standards invariably make securing learning outcomes targets more difficult than normal yet at the same time, more important. So, when a fellow educator was observed using brain-based education against stiff performative and managerial odds to both execute a skilful teaching routine worthy of professional admiration and, more importantly, demonstrate a model of practice that seemed to produce learning outcomes that would render the required targets achieved, it is perhaps unsurprising that brain-based education seemed to be the teaching instrument that everyone wanted to try out for themselves. The visible success of relatable others no doubt contributed to the practitioner's feelings of self-efficacy at the initial level of whether they themselves would be equally successful with the brain-based model of practice. During such modelled events perhaps, they were likely evaluating the extent to which they thought they would be successful if they implemented the same brain-based models of practice, thinking to themselves that "I can do this too!". Furthering this argument, it is also plausible to assert these demonstrations offered the practitioners opportunities where they began their formulations of exactly how they could or would have to adapt brain-based education to fit in to their own classrooms. In other words, while they were watching others they were beginning the heuristic process of adapting the operational devices of brain-based education. Again, this is a novel finding.

When considering the matter of efficacy, it is important not to overlook the second reason given for why brain-based education appealed. There was a very strong feeling that brain-based education was best/good practice. This finding similarly joins the category of novel empirical findings. One of the findings in *Theme Two: Memes, mechanisms, messages, and mayflies* was that one of the four main messages that was repeatedly circulated about brain-based education was that it was best/good practice. As I argued in that theme, the involvement of influential educational agencies with brain-based education lifted the standing of the claims made by its designers and propagators, in particular ascribing normative status to their assertion that brain-based education was best/good practice. Being cited as a reason for its appeal suggests that practitioners had been highly receptive to these messages about best/good practice. However, I am not entirely convinced that they accepted the idea that brain-based education was best/good practice totally at face value and in isolation. My earlier finding about the power of a live, accomplished, and successful teaching performance using brain-based education contributing to its appeal on grounds of its perceived effectiveness is perhaps also implicated here. Arguably the vigour of the circulating normative proposition that brain-based education was best/good practice was further reinforced by witnessing respected fellow educators using it to purposeful, dramatic and most saliently, successful effect.

Expediency

There was a sub-set of practitioners' responses that indicated there was a strong sense that brain-based education was a teaching model of practice that did not cause them difficulties, create problems or present obstacles (Leonora's "What's not to like about it?"). It must have appeared to the practitioners as an approach that was in stark contrast to neuroeducation's penchant for technical and confusing and difficult to navigate material (Sylvan and Christodoulou, 2010; Hardiman, 2010; Alferink and Farmer-Dougan, 2010). I deal with this series of responses under the category of *Expediency* and begin with the idea of what I call 'implementality'. The data showed that a big determinant in the appeal of any new teaching initiative to the practitioners was the ease and speed they anticipated it could be operationalised. Practitioners exhibited an aversion to having to expend any excessive planning time and preparation effort to get any new model of practice into a format whereby it was 'classroom-ready'. Audrey's "These [operational devices] were things we could actually put back in place very quickly and easily" speaks to how they were acutely interested in brain-based education as a prospective teaching approach because it was "able to provide teachers with something that they could use in class straightaway" (Pickering and Howard – Jones, 2007, p. 112). This is congruent with what was discussed in *Mechanisms* about the entrepreneurial nature of the developers of brain-based education and is what is explored next.

As well as being easy to implement, the data also showed that the participants considered brain-based education to be well served in terms of auxiliary resources, which unlike academic literature were not behind paywalls, for example Michael's references to Cheshire LA site for VAK theory or SNS's Pedagogy and Practice: Teaching and Learning in Schools (Key Stage 3 National Strategy, 2004) that gave advice on the implementation of VAK and Multiple Intelligence theories (see earlier). Inherent in their perceptions that brain-based education was a model of practice that was "cleverly packaged" (Suzanne) and "written by teachers for teachers" (Mabel) was the notion that it was a bespoke entity created by individuals on the same wavelength as them. The data confirmed neuroeducational suspicions that as a product, brain-based education was purposefully crafted to resonate with educators (Sharp et al., 2008). Nominally then, given no data to intimate otherwise, the absence of the patronising approach that Anderson and Della Sala (2012) accuse the neuroscientists of habitually indulging in can only have served to exacerbate the development of a positive connection with the designers who were inordinately tuned into their specialised needs and wants. On this premise, the findings could be interpreted as a powerful demonstration of an understanding based on a shared value-system between two groups about was at stake in an education system "focussed [sic] on results, efficiency and effectiveness" (Taylor, Rizvi, Lingard, & Arnold, 1997, p. 81). Accordingly, I argue that it is not unreasonable to speculate that the professional affinity the practitioners felt with the authors of brain-based education bestowed affective saliency upon it and perhaps sealed its status as a model of teaching that exuded expediency.

That being said, I sensed that what underlay these expressions, that all had their roots in pragmatic and operational concerns as I have shown, was the cogent belief that the faster and easier any prospective model of practice that signalled an 'outcomes dividend' could be enacted in the classroom, the sooner those promissory allusions could be crystallised or indeed be debunked. It is entirely plausible to ascribe the need to have all new teaching strategies yielding benefit in the *hic et nunt* rather than in some distant future given educators' need to focus on pursuing short-term outcomes for their students (McQueen, 2014). As Ozga (2008) observes, educators are governed by numbers and the concomitant emphasis on accountability (Hoyle and Wallace, 2005). These KPIs seem to have driven the practitioner's behaviour that is entirely congruent with Jensen's (2008) argument that education can't afford to wait until the (putative) science behind brain-based education is proved. Ultimately, as (Ball, 2015) predicted about what would happen in a neo-liberal system, the practitioners "c[a]me to make decisions about the value of activities and the investment of [their] time and effort in relation to measures and indexes and the symbolic and real rewards that might be generated from them" (p. 299). The cogent point here is that united practitioners' positive dispositions to brain-based education in the dimensions that I have just highlighted, was that they anticipated, and subsequently encountered, few, if any, practical obstacles in its implementation: in short, it was the perfect bench-to-bedside model of practice.

Explanatory

I have used the title of *Explanatory* to group appeals that were all predicated on how brain-based education facilitated and accommodated practitioners' understanding and interpretation of a collection of circumstances where learning had become or had given the impression that it was problematic. As Table 9.1 shows, there were three separate reasons tendered for brain-based education's appeal classified under this category. All three reasons exhibited a close correspondence, differing only in the nature of their subject i.e. who the 'owner' of the learning issue happened to be. Firstly, and specifically, practitioners were attracted to VAK theory and Multiple Intelligence theory because these two operational devices gave them a plausible and rational way of accounting for their own historic learning difficulties. Likewise, and also replicating the results of Alekno (2012) and Hook and Farah (2012), practitioners were also attracted to brain-based education because it enabled them to understand the learning difficulties and the disruptive behaviours of their students. Lastly, there was an attraction to brain-based education because it afforded the practitioners some degree of explanatory power to understand the difference between good (successful) and poor (unsuccessful) teachers. Practitioners' rationale of poor educators was that they were unsuccessful primarily because although they could recognise when their existing teaching strategies didn't work, crucially they were *unable to learn* how to remedy that situation.

At a more abstract level still, the commonality amongst this grouping of responses was that many practitioners appeared to be looking for plausible answers to hitherto unanswered questions about teaching and teachers. Bearing in mind that that the practitioners were all in an LA where nearly all its schools, educators and LA personnel were actively struggling with delivering the required performativity and had been for some time, the responses acutely reflected a sense that the practitioners were preoccupied with fathoming for themselves out the underlying constitution of teaching success or failure. Even at the best of times, teaching is not without its complexities - my estimation is that the practitioners were trying to build up a personal cache of understanding about what happens when it goes wrong. I consider that the practitioners found relief in brain-based education in their attempts to comprehend the basis of success and failure in system whose "express purpose [was that] of student achievement" (Lovat, 2010, p. 490). This is primarily because it offered uncomplicated explanations, consistent with common-sense understandings, or folk-understandings (Bruer, 1999; Geake, 2008) rather than as had been suggested by for example, Gülpinar (2005), Zull (2006) and Wachob (2012), constructivist theories of learning. To compound this, brain-based education gave them tangible and valued insights into their own, often troublesome personal learning experiences. Moreover, as Pashler et al. (2008) observed:

> If a person or a person's child is not succeeding or excelling in school, it may be more comfortable for the person to think that it is the education system, not the person himself or herself, is responsible. That is, rather than attribute one's lack of success to any lack of ability or effort on one's part, it may be more appealing to think that the fault lies with instruction being inadequately tailored to one's learning style. In that respect, there may be linkages to the self-esteem movement that became so influential, internationally, starting in the 1970s (p. 108).

Thus, the combination of these multiple benefits seemingly served to support brain-based education's appeal as a convenient, uncomplicated, and available explanatory tool for practitioners.

Hearts and Minds

I considered the title of *Hearts and Minds* to be fitting for the group of responses listed under this classification in Table 9.1 owing to their collective preoccupation with the affective domain of the participants. A notable feature of the responses was the emotive nature of the language used about brain-based education. This type of impassioned expression was also to be seen in their descriptions of PD events (see *Theme Two: Memes, mechanisms, messages and mayflies*). In the interviews, the practitioners' excitement about the 'wow-factor' they felt brain-based education to have had was palpable. When they were first exposed to brain-based education, the participants powerfully remembered the way that it seemed to them to be a model of practice that was unlike anything they had met before. Presumably it appealed because it didn't resemble the pre-determined and tested/modelled truth as represented by system generated centralised pedagogy (Skourdoumbis and Gale, 2013). Amplifying this, there was a strong feeling amongst some participants that brain-based education was consummately appealing because it appeared to be innovative and pioneering (Miles' "I was excited by something that was very innovative."). Their sentiments chimed with those who described brain-based learning as an exciting idea (e.g. McCall, 2012) and Hook and Farah's (2012) empirical findings. Despite there being no evidence in this study to suggest that the dispersions/invocations of fake neuroscience were implicated in any material way in the considerable attraction that the practitioners' felt to brain-based education, perhaps their inclusion was contributory to fostering the strongly held impressions that brain-based education had been at the cutting-edge of models of practice. Consequently, it seems that the practitioners were not so much affected by the predicted neuro "dazzle effect" (Keehner and Fischer, 2011, p. 118), but rather by an effect predicated on pedagogical trailblazing that was altogether more compelling and infectious than a few PET or EEG scans and fMRI or CT images. As I discuss in the next sub-section, many practitioners linked this novelty to other rationales for its appeal.

To conclude this classification of *Hearts and Minds* I have left, the most interesting category of appeal till last, that typified by Hannah's "We need something to get us excited about". Although not all practitioners ventured forth on this topic, nonetheless, it is a finding that invites comment because I contend that it can be interpreted using the concept of pedagogical gaslighting. This is because like the educators in the Elton and Male (2014) study, as a consequence of being divested of pedagogic authority (Bourdieu and Passeron, 1990, p.12) and their interactions with a steady stream of educational agencies who were focused on delivering, enforcing and measuring the success of a raft of mandated and otherwise policy and practice initiatives, the practitioners struggled with changing notions of what is right and what works. Recognising them as influential practitioners means that it is not entirely clear that they lost their pedagogical compass or their professional confidence. Nonetheless their presence in a "matrix of uncertainty" (Courtney, 2014, p. 638), and was what counted as teaching success, was kept deliberately variable and short-lived by an inspection regime that was itself in flux and riddled with ambiguity and fuzzy norms. In such a situation they would not have been immune to being at risk of pedagogical gaslighting.

Primarily, as I explained, the purpose of gaslighting is to cause doubts about what constitutes reality. I argue that the features of the post-panoptic operational environment as just described, particularly the application of calculated wriggle-room by Ofsted to its judgments of teaching, caused by its obfuscating, slippery, and oblique 2012 inspection framework could well have caused the practitioners to look for a model of practice that could provide them with mechanism for deflecting or negating altogether the effects of pedagogical gaslighting. I tentatively theorise that James's "It gave us something to believe in and to put our efforts into" exemplifies how one important aspect of brain-based education's appeal resided in its ability to be perceived as a model of practice capable of supplying legitimated pedagogical security and certainty. In short, brain-based education functioned as a device that won their hearts and minds.

Personal

This group of reasons coalesce about the participants' perceptions that brain-based education was appealing because it offered them advantages in a personal capacity. These ranged from benefit in the career advancement stakes, to giving them a point of differentiation with other educators and to making them feel more professional. It is my view that advancing careers and being unique are very similar, so I collapse the discussions on these two reasons together and present this first. Although inclusion in the interview sample was not based on any seniority criteria, rather it was to do with the (significant) level of influence in matters of teaching participants wielded across the LA, it was certainly the case that most had achieved a significant level of career advancement by the time of the data collection. The high rate of historical usage (see Figure 8.3) and the contemporaneous elevated level of seniority make for an interesting, although speculative comparison, especially given that many of the participants were considerably younger at the time when brain-based education first arrived on the education scene, and possibly were, as Miles contested, "young members of staff who are aspiring to leadership roles … very keen to appear to be innovative". One obvious interpretation must be that indeed, the appeal of brain-based education as a means to advance careers was correctly recognised by practitioners and enacted upon as they sought to enact the "neo-liberal grail of 'choice' and 'voice'" (McGregor, 2018, p. 85).

While the desire for career advancement is perhaps an attribute that is determined more by individual personality and less by the peculiarities of the circumstances the practitioners occupied, it is of interest and relevance that there was also the identification of the importance of still having a unique teaching style (William's "being thought of as different "was everything in teaching these days"). One plausible explanation is that the practitioners were early adopters of brain-based education sensing that with any other new model of practice there is only a limited window of opportunity before it becomes commonplace and its use ceases to warrant attention and indeed, praise and/or admiration. That being said, the desire to make their teaching performance stand out and the linking of brain-based education with career progression is perhaps saliently interpreted as another practitioner response to the performativity demands of the neo-liberal operational environment. Moreover, it is a response that shares interpretative commonality with the earlier discussion about the appeal of colleagues using brain-based education. This is because they are all examples of the way in which the system is structured to ensure that not only are educators habitually required to perform on demand but indeed, that system has privileged a "competitive dynamic" (Ball, 2017, p. 54) amongst educators and schools in the hope that this competitiveness will drive up standards. Performing to advance prospects of promotion and reputation, as I claimed previously are merely specific instances, albeit critical ones, of this performativity-in-action and "As such they … represent the worth, quality or value of an individual … within a field of judgement (Ball, 2003, p. 57). The data demonstrate that the practitioners found appeal in brain-based education's prospect to generate suitably favourable performances in that external, norm-referenced field to propel them from the ranks of the normal to the ranks of the worthy, auspicious and privileged few. The basis of these appeals shares commonality with the finding that brain-based education was thought to confer commercial advantages in a competitive market because the headteacher concluded that it would demonstrate that the school was both at the cutting edge and different (Whitehead, 2011).

The identification of some aspect of brain-based education's appeal being bound up in notions of professionality at first glance seems to accord with Hook and Farah's (2012) equivalent finding. Making the connection between professionality and knowledge, Hook and Farah's respondents felt that as professionals they should know about "the science of learning and brain development" (p. 338) even if they didn't ever anticipate using it. Somewhat alternatively, as predicted by (Ball, 2003), practitioners in this study having been obliged to adopt the practices and lexicon of the private sector, were more concerned with the specialist vocabulary and the teaching skills that the brain-based techniques imbued them with. James' analysis that "Because teaching is hard teachers do like to think that it is a profession with its own techniques and that it has its own professional language, the more stuff like this, the more teachers think they have skills" cogently exemplifies how educators framed their understandings of professionalism not in terms of the acquisition of scientific knowledge about brain function and how it might relate to theories of learning, like Hook and Farah's (2012) respondents did, but in terms of the altogether more outwardly visible paraphernalia of professionalism. In addition to illuminating how the practitioners conceived of professionalism, the data further serves to posit that not only were the practitioners signalling underdeveloped sense of professionalism, they were claiming that brain-based education was appealing as it offered itself as a remedial intervention for addressing that deficit. Rather than cheapening their professionalism (Sharp et al., 2008), it appeared that the practitioners felt that brain-based education contributed to its restoration, at least in visible, if not somewhat superficial ways. In marked contrast to the prevailing neuroeducational deficit view, the practitioners and the brain-based educationalists were united in positively connecting brain-based education with enhanced professionality, if not for manifestly different reasons. Perversely, Jensen's (2008) rather ambitious declarative statement that "[A]s a result of years of work by brain-based educators, educators are a far more informed profession. They are more professional" (p. 415) perhaps has more in common with the neuroeducationalists and Hook and Farah's (2012) respondent's focus on scientific knowledge in that its rationale also rests on scientific knowledge, although it is the contested nature of the scientific knowledge that drives a wedge between the two counterparty's opinions.

Thus, the array of reasons contributing to the allure of brain-based education was almost byzantine in its complexity and scope. Although not every practitioner discussed every reason, each practitioner was able to marshal multiple and varied reasons for finding brain-based education appealing. My assessment is that the sheer breadth and diversity of the rationales that were proffered begins to help us understand why brain-based education became the phenomenon it did during its hey-day. In the next section I explore the practitioners' feeling that at least temporarily, brain-based education presented as a good candidate for the metaphorical Holy Grail of teaching.

The quest for the metaphorical Holy Grail of teaching

The findings that I discuss now were, for me, some of the most unexpected and the most interesting of the research project. Despite there not being a direct question on the interview schedule, the topic of successful teachers and their putative characteristics was discussed often by practitioners in their answers. These sentiments first appeared within the context of the interview responses relating to reasons for being interested in brain-based education (see *Explanatory*). It was clear by the nature of the responses that the question, although specifically focused on brain-based education, had metaphorically speaking lit a blue touch paper for very many of the practitioners. [Light the (blue) touch paper is an idiomatic expression meaning an action that provokes an excited (or angered) response in others.] The matter that elicited these heartfelt and animated responses was that of the need to be constantly searching for models of practice that work in the classroom. The strength of the participant's feelings that this was a matter of major concern was undeniable, with all but two practitioners venturing forth on this subject.

The participant's phraseology deployed to signal what they were looking for – magic bullets, the panacea effect, and quick fixes – closely mirrored that used by neuroeducationalists (Ansari & Coch, 2011; Geake, 2008; Hardiman, 2010; OECD, 2007) and those pronouncing on the practitioners' operational environment (Edgington, 2015; Godfrey, 2014; Pollitt, 1992). Nonetheless, I found myself loathe to ascribe any fast equivalency to the participant's interview responses and the purely theoretical suppositions that infer educators indolently are dependent upon others to supply them with the miraculous remedy. Although a superficial reading could suggest that both parties were connoting similar views, my interpretation was rather that the participants used these idioms to try to capture the immensity of their need to find the yet undiscovered model of practice that would cut through the exigencies of their tenure in the (hostile) neo-liberal operating environment and provide an immediate solution to the associated, hitherto intractable teaching problems. Miles' "I'm not looking for a simple algorithm" powerfully rebuts the consensus that educators were content with reductionist or naïve solutions. Empirically, the practitioners and Alekno's (2012) educators found common ground on this matter sharing the view that brain-based education was viewed as an opportunity to expand their teaching strategies so that they could better respond to their student's needs. For practitioners searching for the consummately effective teaching model of practice was more than a matter of just *being told* what works (Goswami, 2006), *being given* easy-to-follow recipes (Ansari and Coch, 2011) or *receiving* broad-brush messages (Goswami, 2006).

I concede that they openly welcomed "embryonic solutions" (OECD, 2007, p. 124) and they thereby evidentially became guilty of the neuroeducationalists' charge that education/educators are susceptible to accepting unscientific initiatives. But the conscious decision to receive these so-called "half-truths, ready-made solutions, quarter-panaceas, and myths" (OECD, 2007, p. 124) was taken, I suggest, as a call to pedagogical action. Miles' "We can all find that thing that doesn't work" indicates that they knew from their not inconsiderable teaching experience that brain-based education was not the canned set of blueprints (MacBeath, cited in Smith, 1998) it was conceived to be by some, but an unfinished product awaiting upcycling, a tacit stratagem that offered the realistic promise, after some experimental adjustments, of optimising academic outcomes. In short, as I shall argue in the final two themes, the practitioners were not the passive recipients and perfunctory implementers of putatively theoretically privileged solutions they are reported to be – the reality is much more complicated and nuanced than the prevailing binary views would have us believe.

I would like to unpack Miles' "Again, it comes down to that we're all looking for that thing" because I would not like to overlook the fact that this declarative statement revealed additional, novel insights into the practitioners' relationship with the phenomenon of brain-based education. The practitioners' responses implied that being actively engaged in the search, i.e. cultivating a searching frame of mind, itself was more important than the find. I submit that the quest was as much of an outcome as was the expected destination - that's why I thought that naming this theme after the quest for the Holy Grail was fitting. The data here opens a window onto two imbricated and deeper understandings. Firstly, I tender that to some degree the practitioners were locked captive by feelings of hopefulness believing that just beyond the event horizon there was indeed something better out there. It appeared that the very act of being engaged in such an activity marked them out - in their minds at least - from less successful educators. Full assimilation into the prevailing managerialised milieu meant that the practitioners desired what the system needed (Lyotard, 1984). Their unquestioning adherence to corporate aims (Pollitt, 1992) created an infatuation with the process of 'becoming' rather 'being' (Britzman,1991). However, being imbued "with [the] impossible power of transforming educational failure into success" (Reay, 2006, p. 292) meant that their noble optimistic attachment was to an idealised, very possibly a fantasised and thus ultimately unobtainable model of practice.

Secondly, I propose that Miles' "I'm still looking to become a better classroom teacher by finding that something" shows that the practitioners were keen to use brain-based education because they believed it would improve their practice. In expressing this desire, the practitioners showed much affinity with Greenwood's (2006) educators who were "looking for a better way to teach and that this [brain-based education] theory would help them be better… practitioners" (p. 80). This behaviour – characterised by its orientation to self-improvement - is entirely consistent with the government's position in the 2010 White Paper, *The Importance of Teaching*, that educators (and schools) are responsible for their own improvement, and a system where the development, searching out of, use and sharing of efficacious models of practice is viewed as absolutely crucial (Brown, 2015). Practitioners' rejection of mediocrity was also couched, as Miles once more exemplified, in terms of wanting to "Change the lives of the individuals we work with … [to make them] better learners". They therefore also rejected the assertion that the primacy of caring relations in work with students was an indulgence of the past (Smyth et al., 2000). In other words, there were powerful desires to act in the best-interests of students and self-improvement. The finding that practitioners conceived of brain-based education as model of practice that facilitated their drive for their pedagogical self-improvement diminishes the canonical neuroeducational sentiments that it is a toxic influence on educators' teaching behaviours. For example, the contention of Rato et al. (2013) that practitioners use of brain-based education "might ultimately impair their teaching – or simply waste time investing in techniques that will not aid their students" (p. 441) is completely contradicted by the data. As Pollitt (1992) explains, in pursuing improvements, in this case teaching practices, practitioners are potentially acting as any labour force operating in a managerialist arena would do. Moreover, the installation of the ideal of productivity that emanates from the policy technology of managerialism is compounded by the pursuit of efficiency that emanates from its sister technology of performativity (Locke, 2015). Is it any wonder then that what is needed "are new kinds of teacher for whom excellence and improvement are the driving force of their practice" (Ball, 2003, p. 223)? In some ways, my data does indeed show the existence of such educators. I advance these interpretations next to posit that how the new class of educator Ball surmises is called up by these technology projects are also pedagogically promiscuous.

Pedagogical promiscuity

The findings discussed next also are characterised by their unexpected and novel nature. The practitioners recognised that their pursuit for the metaphorical Holy Grail of teaching was not consequence free. It was largely accepted that there was a risk of falling victim to unscientific and/or empirically unvalidated teaching initiatives, or indeed, succumbing to "bandwagonitus" (McCall, 2012). Throwing their aversion to risk out of the window, the practitioners clearly felt that the ends justified and indeed necessitated the means. As earlier noted, educators' attraction to and use of brain-based education was conceivably an instantiation of specific type of response to the neo-liberal operational culture. Within this environment with their raison d'etre constructed in terms of their ability to secure the externally determined outcomes, promiscuous behaviours were not only cultivated, they arguably become essential, for as Miles explained "teachers are under increasing pressure to do things that they wouldn't normally have done … and that will only get worse". Producing the necessary and sufficient level of improvement in student achievement (Lovat, 2010) meant the serious contemplation of every and any new teaching initiative. I have already shown how the allure of brain-based education was multi-faceted and argued that this potent combination of separate attractions caused practitioners to consider it as having enough pedagogical potential to consider it as a credible contender for implementation. Nonetheless, I think that an examination of the 10 per cent Myth in its relation to brain-based education here would be instructive to explain why brain-based education became a teaching initiative that practitioners felt tempted to become promiscuous with, or as Michael counselled, a model of practice they should not close their minds to.

Every brain-based strategy or methodology has its own unique brain-based footprint, but they are united by their common underpinning central and compelling belief that educators who adopt their methods will unleash the hitherto inactive and underutilised brainpower of their students. For example, Smith's (1997) claim that "Accelerated Learning carries with it the expectation that, when properly motivated and appropriately taught, all learners can reach a level of achievement which currently may seem beyond them" (p. 49) arguably typifies the way in which brain-based education has employed the alluring prospect that there are hidden reserves of brainpower, intelligence and cognition in individuals waiting to be mobilised by the right i.e. brain-based models of practice. Brain-based education's invocation of the 10 per cent Myth is highly persuasive, certainly latent and possibly bordering subliminal decision-making territories, in that it actively encourages practitioners to think that their existing models of practice are disadvantaging their students. For example, Hart (1981), an early developer of brain-based education, diagnoses the problem and conveniently provides the remedy - namely that existing teaching methods are brain antagonistic and that the causal learning failures can be eliminated. For some considerable time (see Theme One), brain-based education propagated the notion that if it wasn't the metaphorical Holy Grail of teaching strategies per se, nevertheless, it was a model of practice that promised to unlock the brain's full learning capacity. Thus, in Westford's operating environment where practitioners teaching efficacy was joined up by a straight line to student academic outcomes (Skourdoumbis and Gale, 2013), overlooking such a bestowment was likely to be done at their peril.

The promiscuous 'going with' or 'trying out' brain-based education by practitioners was not accompanied by evidence to indicate that it was accompanied by any hesitancy invoked by conflicts of interest or ethical dilemmas (Benade, 2012) about its theoretical, putative or otherwise basis. Rather, the incentivisation to maximise student attainment, especially in the short-term, caused the practitioners to be unperturbed by adopting practices that were considered by the neuroeducationalists at least, to be damaging and erroneous. Nor was there evidence to suggest that the practitioners were especially risk-averse to trying out new models of practice. Rather, akin to Bottery and Wright's (2000) technical-rationalist implementers, they behaved as entirely rational operatives in a high-stakes educational system where the normalising forces arising from the surveillance and performance culture were powerful, unrelenting but most of all, unforgiving. Surviving and succeeding required using all means at their disposal to effect improvements in academic standards. They ignored the unscientific (or otherwise) basis of brain-based education because in their estimation it offered the prospect of immediate gratification. Their promiscuity was also forward -orientated. Michael's "The research is constantly evolving" signalled that the practitioners were consummately aware that the gratification offered by any existing model of practice could not be relied upon indefinitely in an environment where performance league tables and exam results were fetishised (Blair, Gillborn, Kemp, & MacDonald, 1999) and you were only as good as your last set of results. The use of brain-based education to game the system was thus only ever provisional and temporary as practitioners knew, as I highlighted earlier, that they would soon be moving onto the next new thing *(see Theme Two's Mayflies)*.

Theme Four: Darwinian pedagogy

This theme borrows ideas from Darwin's Theory of Evolution to illustrate how many of the operational devices were purposefully adapted to effect, often multiple, alternative functions that went significantly beyond their original design intentions. This theme also considers how perceived/actual utility can be seen as an important explanatory factor behind the unequal decline in the practice of the operational devices. In short, this theme is about the extent to which and how exactly, practitioners used the operational devices.

The scale of reported use

Figure 8.3 revealed a consistent, but slightly uneven pattern of declining use across all the operational devices. Participant comments about the perceived/observed use of the operational devices across the LA by other educators mirrored this analysis, as Table 9.2 shows. Table 9.2 presents an overall summary of this study's findings on the levels of use as they compare to those reported in the empirical literature. It is based on the data provided in Figure 8.3, Table 8.4, Table 4.2, and practitioners' perceived use by other Westford educators. I excluded Accelerated Learning and the 10 per cent Myth in Table 9.2 because of the inconsistency found in Accelerated Learning's reported use versus that of its constituent devices, meaning that its explanatory power in this examination of levels of use is compromised. Despite its inclusion in other prior research studies (e.g. Alekno, 2012), I have also eliminated the 10 per cent Myth since it is a neuromyth rather than teaching strategy and it was not used by practitioners. Historically, VAK theory and Mind Mapping were the only two operational devices that were reported as having been used by more than 50 per cent of the participants. As shown in Table 9.2, this finding for VAK theory's historic use was not particularly ground-breaking. My interpretation goes beyond simply revealing this. It shows that widespread use of the operational devices was in decline.

Table 9.2: Comparison of findings concerning self-reported use with the empirical literature

Operational device	**This study:**				**Empirical Evidence: self-reported *historic***
	Self-reported *historical* use (no. of participants)	**Perceptions & observation across LA (*historical*)**	**Self-reported *contemporaneous* use**	**Observed & documented *contemporaneous* use**	
VAK theory	14	Substantial	10	0 observations 2 mentions	High level of usage well established across four studies
Mind Mapping	8	Substantial	7	0	Two studies are not enough to establish level of use
Mozart Effect	6	Limited	3	0	Two studies are not enough to establish level of use
Enriched Environment	5	Limited	2	0	Two studies are not enough to establish level of use
Multiple* Intelligence theory	5	Moderate	2	0	Two studies are not enough to establish level of use
Brain Gym®	2	No historic	1	0	Two studies are not enough to establish level of use
Brain Laterality	1	X	0	0	Two studies are not enough to establish level of use

Operational device	This study:				Empirical Evidence: self-
Whole Brain Learning	1	X	0	0	No evidence

[Key: X=not mentioned, *= Rato et al. (2013) reported on contemporaneous use]

The same conclusion cannot be drawn for the equivalent finding about Mind Mapping, or the associated findings that it was only VAK theory that continued to be practised by any significant level of practitioners. The reason for this, is as Table 9.2 (Column 5) shows, is that there was a prohibitive level of prior research about Mind Mapping available to facilitate any overall credible or meaningful comparison. This situation also applies to the remainder of the operational devices scrutinised by this inquiry. Nevertheless, being unable to corroborate the study's findings - that the level of use had declined considerably but that VAK theory, at least in name, was still being practiced by at least 50 per cent of practitioners- against the empirical literature does not invalidate them. Rather, these results support Alekno's (2012) contention that the assumed popularity of brain-based education has not translated into as wide an acceptance and practice as the neuroeducationalists supposed. In the next section, I explore how the practitioners went beyond being "content with – even takes delight in – quick, simple, and unequivocal explanations" (OECD, 2007, p. 124) to creatively adapting the operational devices they did report using.

How the operational devices of brain-based education were used

In this section I advance the data presented in Chapter 6 about the findings that showed the practitioners were almost universally employing the operational devices in alternative ways to that which was originally prescribed by the devices' designers. This result was something I had not anticipated. Although there was some limited anticipation of this in the conceptual literature, where Howard-Jones (2008) supposed that VAK theory was being used as differentiation, his conjecture lacked empirical support. As such, it appears to be an unmatched finding. Brain Laterality, Whole Brain Learning, Accelerated Learning, and the 10 per cent Myth are excluded from the rest of this discussion because, to recap, for the first three, no explanations of use were proffered and the 10 per cent Myth was reported as not being used. This leaves the six operational devices of Mind Mapping, VAK theory, Multiple Intelligence theory, the Mozart Effect, Enriched Environments, and Brain Gym® as the devices scrutinised here.

For each operational device, Table 9.3 contrasts the analysis in terms of its range of uses as indicated by practitioners (Table 8.6) with its intended use (Table 2.2). For Mind Mapping, there was a good correspondence between intended uses and actual uses, for those actual uses I have called Literacy, Organisational Skills, and Examination Revision. Similarly, Enriched Environments were used as intended in regard of attention to the physical environment and the attempt to ensure that stress is eliminated. As noted in Chapter 2, the use of Mind Mapping for pedagogic differentiation or PL do not form part of the intended uses of this operational device. The same situation applies in regard of Enriched Environments being used for formative assessment and behaviour management. A divergence between intended and reported use is replicated for the remainder of the operational devices. I consider this 'discordant' use to be an interesting feature but before I explore it more closely now however, I attend to the matter of whether or not any uses of brain–based education - discordant or otherwise -can be considered to be constructivist.

Table 9.3: A comparison of the actual method of use to the intended method of use for each of the operational devices of brain-based education used by the participants

Operational device	**Original intended uses/application**	**Reported actual uses/applications * means that participants' self-reported use accorded with intended use**
Mind Mapping	Originally, a graphic technique for note-taking/note-making*. Later Mind Maps were suggested as a prelude to an essay, project and/or report writing and as preparation for examinations particularly in terms of memorising content*.	Exam revision (Learning)* C Pedagogical differentiation C Developing students' organisational skills*C PL C Literacy*
Mozart Effect	Mozart or other baroque music should be played to learners during the learning process.	Behaviour management Episodic lessons

Operational device	**Original intended uses/application**	**Reported actual uses/applications * means that participants' self-reported use accorded with intended use**
Brain Gym®	The use of 26 movements, each designed to target the improvement of an academic skill. For example, to improve reading comprehension, 'The Calf Pump', the Footflex and/or The Grounder exercises would be used (Dennison and Dennison, 2010).	Behaviour management Episodic lessons
Multiple Intelligences	After profiling, learners should receive instruction that is matched to their Multiple intelligence profile.	Pedagogic differentiation C Curriculum design Literacy
Enriched Environments	An enriched teaching/learning environment attends to space, heat, light, ventilation and ensures that stress is eliminated. (Smith, 2002)	Behaviour management Formative Assessment Physical environment* Elimination of stress*
VAK	After profiling, learners should receive instruction that is either matched to their VAK profile or a multisensory approach should be used for all learners where teaching is conducted harnessing all three forms of processing.	Staff development Behaviour management Pedagogic differentiation C PL C

[Key; C=could be considered to be an example of a constructivist approach to teaching]

Whilst my research questions and conceptual framework have not been constructed from a perspective which seeks to rest on the somewhat expansive topic of theories of learning, given that the data has uncovered some surprising uses of brain-based education, I only briefly want to dwell on this matter. The assertion that brain-based education's model of practice is constructivist in its orientation (e.g. Gülpinar, 2005; Zull, 2006; Wachob, 2012) is corroborated for only some uses of some operational devices. In Table 9.3 I have designated those uses which seem to prima facie exemplify constructivist approaches to teaching. For example, whilst the use of VAK theory or Multiple Intelligence theory to provide differentiation is relatively consonant with constructivism, I find it harder to similarly ascribe the use of VAK theory for behaviour management to constructivism. Additionally, there was no evidence to suggest that practitioners used or liked brain-based education, as I have demonstrated in Theme Three, believing that it was a constructivist model of learning or indeed, teaching. Having set out in detail how the operational devices were really used, I next consider how these various mutations were manifested.

A typology of adaptation

When Rato et al (2013) complained that "It seems that the available information is manipulated directly to fit the classroom milieu" as they attempted to explain how the information handling outside "outside academic circles" was unscientific (p. 444), I suspect they had no inkling how close to the reality in Westford their suppositions were. Nonetheless, neuroeducational orientated research has not accounted for the way in which educators altered and adapted the operational devices' models of practice. In proposing a typology of adaptations, I focus on only those instances of discordant use i.e. adaptations. Table 9.4 summarises my interpretation of the nature of these various adaptations. The adaptations ranged from relatively minor ones, for example, the use of the Mozart Effect as a transition aid in the creation of an episodic lesson or VAK theory being used to engage unruly or problematic students/classes, to more substantive adaptions, for example, VAK theory being used to form the basis of coaching conversations to effect improvements in teaching performance or the use of Brain Gym® to calm and de-energise certain types of students.

Table 9.4: A summary of the adaptations executed upon the discordant operational devices by the practitioners

Operational device	**Actual uses/applications as indicated by participants**	**For what purpose the operational device was used by the participants**	**Type of adaptation experienced by operational device**
Mind Mapping	Pedagogic differentiation	Used to enact differentiation by outcome	Alternative affordance
	PL	Used to offer students choice in the tasks or activities they complete during lessons	Alternative affordance
Mozart Effect	Behaviour management	Classical music played to calm the students	Alternative affordance

Operational device	**Actual uses/applications as indicated by participants**	**For what purpose the operational device was used by the participants**	**Type of adaptation experienced by operational device**
		Other music played to calm the students	Operational device altered, and alternative affordance subsequently used
	Episodic lessons	Classical music played to signify a different phase of the lesson or that a different type of learning/behaviour was required	Alternative affordance
		Other music played to signify a different phase of the lesson or that a different type of learning /behaviour was required	Operational device altered, and alternative affordance subsequently used
Brain Gym®	Behaviour management	Used to calm/de-energise students (particularly low ability and younger students)	Operational device was abridged, and alternative affordance subsequently used
	Episodic lessons	Used as a physical interlude between learning activities Used a lesson starter	Operational device was abridged, and alternative affordance subsequently used
Multiple Intelligences	Pedagogic differentiation (also found by Alekno, 2012)	Used to ensure each intelligence was represented at least once per topic in the form of a focused activity	Alternative affordance
	Curriculum design	Used to design the curriculum	Alternative affordance
	Literacy	Used to teach poetry in a novel way but not all eight intelligence types were invoked	Operational device abridged, and alternative affordance subsequently used
Enriched Environments	Behaviour management (also found by Alekno, 2012 but she described it as engagement)	Properly maintained and interesting classroom displays will encourage a sense of respect for property amongst students	Operational device abridged, and alternative affordance subsequently used
	Formative Assessment	Used as exemplification of the standards required	Operational device abridged, and alternative affordance subsequently used

Operational device	Actual uses/applications as indicated by participants	For what purpose the operational device was used by the participants	Type of adaptation experienced by operational device
VAK theory	Staff development	Used to form the basis of coaching conversations to effect improvements in teaching performance	Operational device altered, and alternative affordance subsequently used
	Behaviour management (also found by Alekno, 2012 but she described it as engagement)	Used to engage unruly or problematic students/classes	Alternative affordance
	Pedagogic differentiation (also found by Alekno, 2012)	Used to provide each student with activities to match their VAK dominant modality or to style-stretch (Ehrman, 1996), to develop the weaker modalities.	Alternative affordance
	PL (also found by Alekno, 2012)	Used to offer students choice in the tasks or activities they complete during lessons	Operational device altered and alternative affordance subsequently used

For clarification, I exemplify the understandings of alteration, affordances and abridging as set out below. When I use the term alteration, I mean that the participants modified the operational device to create a new and wholly different teaching strategy, fully separate and distinct from its initial form. Consequently, when used, it would have been unrecognisable as the original operational device to any outside observer. Such an alteration is exemplified using VAK theory to effect PL. Here, instead of creating three equivalent versions of activities to correspond to the three types of VAK learning modalities for every learning task, rather, they indicated that there would be some instances during the lesson where they would provide several alternative tasks. The key modification here is that the alternative tasks did not purposefully seek to address the three VAK types of learning modalities, it was enough that the tasks were merely different in some/any way from each other. At the relevant point in the lesson, the students were then encouraged to choose which of the three (or fewer/more) versions of the task they wanted to undertake. This offering of choice to the student would constitute the use of an alternative affordance of the altered VAK theory, as I shall clarify below. Together, however, the alteration and use of the alternative affordance forms the basis of the interpretation that participants use/d VAK theory to effect PL.

Simply, affordances are opportunities for action inherent in the objects, artefacts, and entities that we interact with. If it appeared that the participant had used the operational device for another purpose/s, I deemed this application to constitute the use of an affordance. As Table 9.5 shows, using their affordances was the most popular way participants adapted the respective operational devices. In addition to the example of VAK theory noted earlier where after it had been fundamentally altered and its alternative function to effect PL was harnessed, another typical example of the use of affordances is that given by Multiple Intelligence theory to effect curriculum design. Like VAK theory, but even more so, the burdensome lesson planning requirements to create sets of eight/nine equivalent versions of activities that corresponded to the eight/nine types intelligence for lessons and then deliver them during the lessons appeared to be rejected. Rather, the action-possibility of Multiple Intelligence theory to scaffold curriculum design was recognised and enacted.

Abridging occurred when the participants only used part of an operational device rather than its fullest intended version. Enriched Environments provided a good example of abridgement. Rather than addressing the physical environment by attending to matters of space, light, ventilation, and colours, and reducing student stress through the creation of positive teacher-student relationships to facilitate additional synaptic density (according to the contested theory), participants said they implemented Enriched Environments in a much-reduced or simplified way. Some participants only talked about attending to the classroom visual displays rather than enacting the fuller range of enrichment prescribed. This constitutes an abridged implementation.

Table 9.5: Summary of the type of adaptations experienced by the each of the operational devices

Type of adaptation	**Operational devices**
Atrophied	Brain Laterality and Whole Brain Learning
Abridged	Brain Gym®, Multiple Intelligence theory and Enriched Environments

Alteration	Mozart Effect, VAK theory
Affordances	Mind Mapping, Mozart Effect, Multiple Intelligence theory, Enriched Environments, VAK theory

Crucially however, as is implied in Figure 9.3, even though they were talking about what turned out to be adapted variants, the participants still typically tended to refer to the operational device by its original name. The only instance of participants explicitly talking about the use of a variant was when they talked about multisensory VAK. This accords with the findings of Brevoort (2012). Brevoort (2012) however asked her respondents about the multisensory variant of VAK theory, rather than the ordinal version. Since this version of VAK is almost indistinguishable from standard teaching it helps to understand why the observations in this inquiry found a much lower instance of use than the participants reported to be the case with their other teaching. The result about VAK theory being used as pedagogic differentiation is consistent with both empirical and theoretical literature (Alekno, 2012: Howard-Jones, 2008).

The finding that Multiple Intelligence theory was used as differentiation and the findings that VAK theory and Enriched Environments were used as behaviour management strategies match Alekno's findings. On the matter of these alternative uses, Alekno simply observed that her participants only used those neuromyths+ that were perceived to have utility in terms of differentiation and engagement. She did not however, as I have done, advance this interpretation any further by performing a finer-grained analysis of exactly how the application of these neuromyths+ differed from their ordinal design intentions. In the next and final theme *Pedagogical engineers*, I develop this set of findings to suggest that the adaptations although essentially heuristic in nature, were purposeful in that they were enacted to fulfil a series of wants, wants which happened to be the very same wants that the system wanted (Lyotard, 1984).

Theme Five: Pedagogical engineers

In *Theme Four: Darwinian pedagogy* I considered how the practitioners adapted the operational devices to extract optimal teaching advantage from them. As a graduate engineer myself having worked at a professional level in industry I had a good insight into the job role. I recognised the overlap of commonality in the Royal Academy of Engineering's definition that "Engineers make things, they make things work and they make things work better. Engineers use their creativity to design solutions to the world's problems" (Royal Academy of Engineering, n.d., n.p.) and what the practitioners were doing. I called this theme Pedagogical engineers because it helped me to frame the data about the wants i.e. 'problems' that the practitioners were looking for solutions to. Thus, this theme is about the reasons why practitioners' used brain-based education. It complements and advances the discussion in *Theme Three: The persistent allure of gothic pedagogy* which covered the reasons why practitioners found brain-based education an appealing model of practice, but it also draws to together critical arguments from all earlier themes. In many ways then, it can be thought of as a summary theme.

We're all being judged

When asked about why they used brain-based education, the participants' answers were typically buried within larger, more overarching discussions about the problems and pressures that they faced as educators today. The entire cohort discussed at some considerable length (67 mentions) the problems of needing to improve standards, the associated accountability pressures, and the need to produce demonstrably good lessons. Uppermost amongst these often angst-ridden and exasperated responses was the acute felt need to maximise student academic outcomes, (Richard's "The key point that teachers are driven by is progress"). Nevertheless, mediating these declarative statements about perceived problems was a practitioner wish to make sure that their students were developed in ways above and beyond the milieu of measurement. This sub-theme, for me, encapsulated two noteworthy issues; firstly, that of the practitioners' grasp of their operational rather than strategic centrality in (Jones, 2014), and acquiescence to bearing sole responsibility for meeting the demands of the neo-liberal education system (Willmot, 1993). The incessant pressure of the education system for change motivated by standards caused other effects (Jones, 2012). The second issue signified a tension between what the participants felt *compelled* to do to comply with, survive and even thrive in such a system and, ideally, what they would *like* to do for their students.

The general tenet of the responses signalled that participants seemed resigned to having their teaching efficacy linked to "student learning outcomes and academic achievement measured and evaluated through quality assurance techniques" (Gale &

Skourdoumbis, 2013, p. 894). Audrey's "Basically, there is a feeling in the schools that teachers have to do everything. Students are not held accountable for anything. It's our fault" exemplified the begrudging acceptance that being the key instrument in the process of improving academic outcomes for students meant that they were burdened personally and held locally responsible by the unrelenting quest for educational improvement (Moore & Clarke, 2016). Accepting that the gaze of performance scrutiny extended beyond student academic attainment alone, the participants were acutely aware of the absolute necessity to perform optimally in all assessments of their teaching competency (Miles' "You know, the whole term requires improvement is such a damning statement for teachers"). Collectively then and without any discernible ambiguity, their responses strongly indicated that they had received the transmissible paradigm (Lyotard, 1979/1984) only to conclude that indeed like many others in education systems around the world (O'Leary, 2013), there is no alternative (TINA) (Berlinski, 2011; Peck & Tickell, 2007). Previously, I characterised the practitioner's responses as being angst-ridden and exasperated however I did not find any evidence to suggest that they were experiencing feelings of shame and/or guilt and/or loss of respect at their capitulation to performativity (Ball, 2003).

There was an absence of explicit resistance and/or guilt present in the practitioners' answers, but I did find evidence pointing to the existence of secondary effects primarily in the guise of conflicts of interest. I would suggest that though they had fully assimilated the neo-liberal narrative to become capable and compliant foot-soldiers in the global educational reform movement (Sahlberg, 2012), prosecuting the war on academic standards pressurised the practitioners' value system. Smyth (2000) argued that survival in the performative classroom makes the "primacy of caring relations in work with students and colleagues" an indulgence of the past (p. 140), but my evidence warrants a revaluation of this opinion. Their conformity, as represented by their acceptance that their raison d'être in an LA that was under duress to effect substantial improvements in KS4 examination results was to bring about those progressions, they still retained a tangible interest in adding non-academic 'additionality' to the students (Steven's "It's about educating the children"). Ball (2003) has suggested that these conflicts of interest are underpinned by values schizophrenia, further writing that the systems calls for educators "who can set aside irrelevant principles, or out-moded social commitments" (Ball, 2003, p. 223). My assessment of the practitioners' stance on extra-curricular additionality is that it could be characterised by the common inversion of the idiom "You can't have your cake and eat it (too)". Mabel's "What bugs me is the fact that you don't get a thank you" highlights that it was not that the practitioners saw the two things, namely effecting improvements in standards and improvements in the student's wider social and emotional skill-set as entirely incompatible or unachievable, rather that there was no account taken of their efforts to improve value-added in the second dimension. Audrey's lengthy quote captures the spirit of this distress at the removal of the "deep contextualization" (Stickney, 2009, p. 214) from the measuring stick they were judged against:

> If you take children who are very challenging, and when they leave in Year 11, they are polite, sensible, mature citizens and can hold a conversation, you have done wonders for those children yet that doesn't count for anything. If because it's that they have low ability skills they only get a G. That's not good enough but actually what you've done for that child and for society far outweighs their academic skills. Yet there is no acknowledgment for that (Audrey).

It seems that the practitioners regretted this situation. The practitioners appeared to consider that such successes, which often occurred in face of putative academic adversity and thus called upon them to deploy additional energy, time and creativity were tangible demonstrations of their efficacy and thus consequently were all the worthier of at least recognition and ideally inclusion in the KPI count. The practitioners were not trying to overturn their first order activities (Lyotard, 1984) i.e. those concerned with the production of KPIs; indeed, they were the epitome of Foucault's (1979) docile and capable bodies (p. 294) but nevertheless, they were keen to express consternation that they believed such important and worthwhile activities should be elevated to the same status.

Before I draw the discussions in this sub-theme to a close, I consider that this is the relevant place to finally revisit the assertions I made about neuroeducation's proclivity to scientistism in Chapter 2. There, I suggested that neuroeducation, with its overtly scientistic stance has seemingly been blind as to how educators' teaching behaviours in the classroom are differently constrained and enabled by the ecology of the highly politicised environment they inhabit. Indeed, both Grace and Steven's direct references to what they saw as the political nature of their operating environment testify to the practitioners own recognition of this status quo. As I have demonstrated, the practitioners emphatically framed the problems they were facing in terms of their efforts to satisfice the policy-defined teaching needs that were expressly and overarchingly aligned with securing standards. In view of this compelling evidence, the neuroeducational theorising that the only priority of the practitioners in respect of brain-based education as a propective model of teaching should have been its scientific validity, is at odds with the practioners' own assessments of their main concerns. In my assertions about the unsuitablity of a scientistic framework for interpreting educators favourable dispostions to and use to brain-based section I suggested that scientism was "a totalizing attitude that regards science as the ultimate standard and arbiter of all interesting questions" (Pigliucci, 2013, p. 144). I now offer a recalibration of that suggestion in the light of the evidence I have discussed here to hopefully make a compelling case that the practitioners' "ultimate standard and arbiter" was not science, they did have a "totalizing attitude" that was borne out of their central implication in the delivery of neo-liberal policy, but ultimately the only "interesting questions" (Pigliucci, 2013, p. 144) for them were those which they have no answers to yet. To restate, since there was no alternative to improving and being accountable for academic standards and as part of that process, operationalising good lessons, the practitioners' behaviours, and decision-making processes were completely rational in that they were predicated on finding solutions to these intractable problems. As I shall show next, the practitioners considered that brain-based education supported them well in their problem-solving endeavours.

I need it now, I need something that works

As I noted in *Research on why brain-based education is used,* there was scant existing 'helpful' empirical research available on the reasons educators attributed to using brain-based education. I refer to the lack of helpful research because when I identified this as a knowledge gap in Chapter 4, I was keen to unpack the exact nature of brain-based education's perceived functionality. Rather than accepting Pickering and Howard-Jones' (2007) somewhat nebulous finding which has found its way into the neuroeducational canon, namely that the operational devices of brain-based education are 'very useful', my aim is to arrive at a better understanding of its underlying value to practitioners. In Theme Three, I examined the data on the reasons relating to the appeal of brain-based education and therefore, where salient, I have already invoked the findings of some of the more informative but less well cited studies to challenge what has become the accepted truth on this matter. To avoid duplication, in this discussion, I only refer to as yet uncalibrated data from this study, and as yet undiscussed external empirical findings. The main uncalibrated result that holds significant explanatory power for understanding the widespread uptake of brain-based education is that the participants used it because it they felt that it improved academic achievement. Like many other of my findings, this replicated Alekno's (2012) results.

The participants offered no supporting evidence or attempted to quantify of the perceived impact they referenced but they were exceedingly adamant that brain-based education had been a causal agent in driving up academic standards in their classrooms. They expressed similar viewpoints that their sole function was the obligation to extract as much academic performance from their students as they could. Kate's "You do definitely hope that this is all going to help with the results, because at the end of the day that's what we're all going to be judged on" brings into sharp focus the overpowering sense that the practitioners had that above all, they needed teaching strategies that effected tangible improvements in the academic attainment of their students. Although there was an inconsistency of expression abroad with some participants referring to impact or progress or even just plain exam results, there was nevertheless a striking consistency of meaning. Whereas in preceding interpretations in this chapter I have merely (hopefully convincingly) inferred the existence of a causal relationship between the practitioners' attraction to brain-based education and the prevailing demands of their neo-liberal operating environment, this is the first instance where I feel that I have enough evidence to move beyond that to assert the existence of a causal relationship between the two. I additionally assert that the imperative experienced by practitioners to secure improvements in academic outcomes was *the* key factor in the widescale uptake of brain-based education. If this claim is accepted, my contention is that the finding should be framed as a direct, unequivocal but predictable practitioner response to the demands placed upon them by a system whose chief driver -the maximisation of academic outcomes -had become normalised.

In this section I address the finding that there was a close correspondence between the final adapted uses of the various operational devices and the previously identified cohort of influential teaching initiatives and ideas (see Chapter 3). In addition to the practitioners' vocal identification that their primary concern was improving standards, with the corollary that they were constantly looking for models of practice that could explicitly deliver on that front, I suggest that the data revealed evidence of a secondary and related issue. It appeared to me that the practitioners had adapted many of the operational devices with the specific intention of fulfilling the requirements of the cohort of influential teaching initiatives and ideas. When the practitioners discussed the antecedents for establishing the conditions for efficacious learning as being classroom management and student engagement, they were singling these out as perennial and pressing teaching problems to which they felt they were obligated to pay pedagogical attention to. Indeed, Weimer (2007) noted the use of brain-based education as an engagement strategy. Along the same lines, I propose that the data examined in *How the operational devices of brain-based education were used* additionally showed that there was a less tacit, more action-orientated marking out by the practitioners of the teaching initiatives and ideas as teaching problems to which they were obligated to pay pedagogical attention. The practitioners were explicitly and implicitly identifying a group of teaching problems that they were seeking to solve: the data suggests that they creatively used brain-based education as the input to fashion or indeed, engineer practical and effective solutions to these identified problems.

Table 9.4 shows that the separate operational devices that were reported as being used experienced mostly discordant implementations. It is my contention that these discordant uses can mostly be directly mapped back onto the cohort of influential teaching initiatives and ideas. In essence, Table 9.4 has presented this analysis, so I do not intend to replicate it here. To advance the argument that the practitioners used brain-based education to 'pedagogically solutioneer', I have selected to use VAK theory. This because it was the operational device that attracted by far the highest levels of stated use in my study (see Figure 8.3) and in others (Table 4.1) thereby making it the most high-status operational device with educators, and also because it was the operational device that featured the largest number of discordant uses in my study. Table 9.4 illustrates how VAK theory was reportedly used to effect staff development, behaviour management, pedagogic differentiation, and PL. Three of these uses directly correlate with the cohort of influential teaching initiatives and ideas and the aim behind the use of VAK theory as staff development was to effect improvements in standards. The adaptations made to VAK theory were not random or without purpose although it appears that they were heuristically undertaken. Rather, the adaptations seemed always to be undertaken with reference to the influential teaching initiatives and ideas. Indeed, the remainder of the range of discordant uses that were created by the practitioners for the other operational devices can all be shown to be attempts to enact – partially or fully – the cohort of influential teaching intiatives and ideas. Alekno (2012) concluded something similar, albeit much more narrowly focused and she did not develop her analysis to the same extent. Nevertheless, she classified her participants as being resourceful, rather than faddists because she felt that the American "No Child Left Behind" agenda – an instantiation of Sahlberg's (2012) GERM - had caused them to look for methods that allowed them to enact differentiation.

I conclude that the ordinal models of practice proposed by brain-based education were only either marginally valued – where only some of their uses kept fidelity with the original design - or indeed, as was more typically the case, not valued at all – where they were only ever used in a discordant way. I consider that there was a lack of fidelity with the ordinal version of VAK theory because as Geake (2008) noted its use as intended always invoked a paradox in that it was almost impossible to provide learning experiences in only one modality. This also chimes with the claims of Maguire et al., (2013) that many of the influential teaching initiatives and ideas had low coherence and a lack of clarity. The observable reality of VAK theory in the classroom is that it is virtually indistinguishable from routine teaching (Guild, 1997) since educators cannot help but deliver teaching in all three modalities (Geake, 2008). In that VAK theory cannot be implemented in the way it is designed to be, I suggest that it should be classed as a 'brittle model of practice'. Borrowing from the domain of Artificial Intelligence, I use the word brittle here to mean that VAK theory would hypothetically work in an environment where variables could be controlled, and resources were not an issue, but it's implementation 'breaks-down' in a classroom because the complexity and demands of real-life teaching and learning are too great. In Artificial Intelligence, brittleness relates to the level of inability of neural nets to "transfer test" (Pontin, 2018, para.7). Transfer test means that when confronted with scenarios that differ from the examples used in training, the neural nets cannot appropriately contextualise the situation and the technology they control frequently ceases to operate properly. I contend that VAK theory is brittle because it does not transfer test from theory to practice. Indeed, the same complaint given the extent of adaptions needed to make them work, could be lodged against all brain-based models of practice.

Finally, I want to conclude this sub-theme by tentatively theorising the remainder of the data in Chapter 7's *I need it now, I need something that works* by reference to the theoretical what works/EBP dialogue and revisit the associated neuroeducational critique that educators were unable to demonstrate criticality. A dominant theme amongst the participants was their craving to use teaching strategies that work (Audrey's "I want things that work with my kids … I need it now, I need something that works"). In expending such a significant amount of time in their interviews on the unprompted topic of what works, the practitioners demonstrated the extent to which they had fully and unhesitatingly assimilated the normative rhetoric around what works/EBP. They had firmly aligned themselves with a causal model of professional action (Burton & Chapman, 2004) underpinned by a value system predominately focused on the relative ability of new models of practice to improve academic standards (Mabel's " I would expect to see that my more of my kids had made progress, or more progress"). They found some operational devices of brain-based education (adapted and ordinal) to be of worth as interventions because they generally, could be relied upon to deliver what was valued – firstly, a way to enact the influential teaching initiatives and ideas, and secondly and its corollary, models of practice that advanced the precious prize of increased learning outcomes (including creating impact or demonstrating progress). Additionally, though, there was another dimension to their framing of what works, and this derived from the practitioners' desires to develop a wider skill set in their students. Consequently, models of practice that developed students beyond the test, were also viewed as helpful and useful. Suzi observes this phenomenon thus, "Students … seem more confident … they are helping others to learn … Students are more resourceful". Those operational devices that did not deliver identified wants were side-lined and marginalised, failing to be considered best/good practice as they just 'did not work'.

What works/EBP is not the only conceptual topic that is invoked by the data in this sub-theme. It is my contention that the data here additionally speaks to the notion of criticality, primarily, the practitioners apparent lack of it according to the neuroeducational literature. Much like the presumption that education has always endured problems with empirical science (e.g. Condliffe Lagemann, 2000; Shavelson and Towne, 2002), a dominant topic in the neuroeducational discourse where there has been much supposition, is that educators lack criticality (e.g. Purdy, 2008) as they cannot undertake "professional reflection on complex scientific evidence" (Geake, 2008, p. 124). I suggest that the data in *Theme Four: Darwinian pedagogy* and the interpretation pursued therein, which reveals the practitioners' behaviours that resulted in heuristic but purposeful adaptations to the operational devices could be framed as a more altogether subtle but applied form of criticality. Granted, the type of criticality that I propose falls short of its established academic definition, but the participants' actions demonstrated to me that, guided by rationality, they were capable of exercising discrimination and selectivity in an altogether more applied, pragmatic manner and moreover this criticality accorded with their rejection of neuroscience knowledge and their prioritisation of impact-based evidence. This is fully concordant with the premise that in an environment where the market has been elevated to be the ultimate arbiter of worthiness, "efficiency and cost-benefit analysis" have become the "engines of educational transformation" (Apple, 2005, p. 276).

We make things that don't work, work

So far, Theme Five has been about why the participants behaved as pedagogical engineers and employed their creativity, knowledge, and experience to use brain-based education to fulfil a set of wants i.e. to extract functional advantage. Although very similar to Darwinian Evolution, there was one important difference in the processes present here: in Darwinian Theory, the functional advantage gained by the species in question occurs gradually and randomly, however, as has been proposed in the previous theme, there was no naturalistic dimension regarding the selection of the functional teaching and learning advantage evident in this context. In this last sub-theme, I look at the data that relates to the way that the practitioners conceptualised their behaviours, perceptions and rationales for investing time and energy to "make things that don't work, work" (Miles).

In Theme Three the participants indicated that an important dimension of being an effective educator was always seeking out the metaphorical Holy Grail of teaching. Displaying congruence with this finding was the data that showed that the practitioners felt that it was a characteristic of an effective educator to be always trying out new models of practice (Penny's "I do think that the most successful types of teachers do try-out and use different types of things and they are successful with regard to results). Even if the model of practice was perceived to work in the way intended by its creators, educators sought to maximise its impact: this was achieved by harnessing its other affordances, and /or without changes to the archetypal mode of application. In the case of brain-based education, as I have discussed, this re-engineering mostly happened when the ordinal pedagogy was theoretically internally incoherent and/or implementable in terms of its intended archetypal use. In this sense, it might be possible to classify the practitioners as "subverting professionals" (Bottery, 2000, p. 67) as they were forced to alter the intended designs of many of the operational devices to get them to work in the way they constructed this construct. Failing that analysis, an alternative view is that the practitioners were 'adapting professionals' i.e. pedagogical engineers. The practitioners' assertions that as effective educators they should be and are always keen to improve teaching initiatives and ideas to extract maximum functional advantage, Grace's "If they work … you can do better" can be interpreted by reference to the assertion that the discourse around "accountability, access and achievement" (Reed, 1995, p.94) has catapulted the idea of improvement to the forefront of educators' conceptions of what it means to be an effective educator. That being said, it is refreshing to know that even in such a hostile environment, practitioners have retained enough agency to rebut, in terms of strategic activity (Reay, 1998) around teaching, the pedagogical doxa - Steven's "Any organisation or training body or method which says, 'This is how you should do it', it really isn't. There are no fixed or definite ways to do it".

Conclusion

The real act of discovery consists not in finding new lands but in seeing with new eyes (Marcel Proust, French novelist, 1871-1922). On this premise, as yet no study comparable to mine exists, as I assert with due "epistemological humility" (Clark, 2010, p. 190), my research has gone beyond simply revealing the extent to which educators used brain-based education or indeed what their knowledge of neuroscience was. It shows that having initially found brain-based education to be a wholly attractive proposition as a consequence of its many individual appeals satisfying a series of felt wants which arose as consequence of the "persuasive discourse" (Maguire et al., 2013, p. 326), the practitioners then felt suitably inclined to move to Stage Two of their decision-making process. The second stage involved practitioners' satisfying a second and third set of wants. As I argued in Chapter 3, the cohort of teaching initiatives and ideas they needed to enact to furnish the centralised pedagogy (Skourdoumbis and Gale, 2013) in order to assure the improvements in academic standards possessed limited specificity making their enactment highly challenging if not fully unfeasible. The practitioners were acutely aware that some interpretative or translatory work (Maguire et al., 2013) was required and accordingly they were seeking new models of practice that would facilitate a fulfilment of this pedagogical need. The practitioners had decided that trialling the operational devices was a worthwhile exercise as they were optimistically anticipating that they would find that the devices did have or had the potential, after some purposeful adaptation, to provide a/the means by which they could successfully enact the cohort of influential teaching initiatives and ideas, produce improved results and educate their students beyond the narrow set of favoured metrics. It is my conclusion that the practitioners' adaptations to the operational devices go beyond mere interpretation or translation. The purposeful adaptations should be viewed as instances of the practitioners engineering solutions to pressing and hitherto insoluble pedagogical problems. Therefore, their ready engagement with brain-based education can be framed as a pedagogical response to the demands of their operational environment.

My data extends earlier analyses of the phenomenon of brain-based education. Not only does it therefore strengthen theoretical accounts of this phenomenon and its confluence with neuroeducation, it offers a new way of expressing how educators' behaviours have been shaped by prevailing neo-liberal paradigm. It raises question about the appropriateness of the scientistic stance of neuroeducation. In conclusion, unscientific though it was, brain-based education provided the practitioners with the wherewithal necessary for them to survive and thrive in a difficult and challenging operational environment. Brain-based education and its stable of fake neuro-operational devices were knowingly and largely purposefully employed by the practitioners to meet a panoply of diverse wants that were ostensibly the product of the wider reform-driven public policy domain. Brain-based education, replete with its ambiguity and artificialness, served to bridge a pedagogical liminal space for practitioners in the sense that it facilitated a movement from 'problems' to 'solutions'. I suggest that the overarching importance of this study is that much like brain-based education, it is a usurper of existing neuroeducational tropes but more than that, it is an antidote to wider contemporary trenchant motifs that paint education as a site plagued by myths and render educators as errant and culpable victims. In sum, in the context of an examination of what educators did with models of practice based on contested science, by using a qualitative approach "to obtain a description of the lifeworld of the interviewee with respect to interpreting the meaning of the described phenomena" (Kvale, 1996, p. 5) focused on this research has opened up new ways of looking at teaching and educators' responses and behaviours.

Chapter 10: **Conclusions**

Chapter overview

The main purpose in this concluding chapter is to answer the research questions. I also revisit my discussion of the limitations of the findings suggested in Chapter 5. Finally, I present one last reflexive account.

Answering the research questions

In this section I reorganise and summarise the data findings to answer the five theoretical research questions. I then aggregate these individual answers to formulate an answer to the central research question.

TQ1. *What understanding do secondary school practitioners have of brain-based education and its teaching strategies/methodologies*? This answer draws on findings from Theme One and Five. The practitioners professed a high level of awareness for brain-based education and nearly all its operational devices. Despite this, they exhibited an extremely poor level of knowledge about brain-based education and its operational devices. The dominant concern of practitioners was not with acquiring new or supplementary neuroscience or brain-based education knowledge so that they could understand why brain-based teaching strategies/methodologies work, but with knowing that they do.

TQ2. Was *TEEP PD the principal source of this knowledge*? This answer only draws on findings from Theme One. Practitioners gained knowledge on brain-based education and its operational devices from multiple and varied sources over a substantial timeframe. The principal source of knowledge was voluntary PD that typically pre-dated TEEP. The most popular operational devices on which practitioners had PD were Accelerated Learning, VAK Theory, Mind Mapping, Multiple Intelligence theory, and the Mozart Effect. There were two types of PD. TEEP-without PD was characterised by a style over substance approach and was typically led by dynamic and charismatic developers who had a vested interest in the brain-based product. TEEP-within PD was led by respected and proficient local colleagues who adopted a more arms-length approach to the materiel.

TQ3. *What brain-based teaching strategies/methodologies, if any, are used by secondary school practitioners, and has this practice changed over time?* This answer draws on findings from Theme One and Three. All the operational devices, bar the 10 per cent Myth, were used at one time by the participants. Of these, the most frequently used were VAK theory and Mind Mapping. After this initial period of popularity, there was a substantial, but somewhat uneven decline in usage across all operational devices. Indeed, at the time of data collection, brain-based education had acquired the status of 'last week's best flavour'. Despite the reduction in the general popularity of brain-based education, VAK theory and Mind Mapping remained as the most used operational devices, being practised, in name, by at least half the practitioners.

TQ4. *How are brain-based teaching strategies/methodologies used by secondary school practitioners?* This answer only draws on findings from Theme Three. The practitioners exploited the affordances of all the operational devices they claimed to use to create new applications that did not accord with their intended use. The most popular uses of the adapted operational devices were for the provision of differentiation and PL to create episodic lessons and ensure appropriate behaviour for learning.

TQ5. *Why do or don't secondary school practitioners use brain-based teaching strategies/methodologies?* This answer draws on findings from Theme One, Two, Four and Five. Practitioners were very attracted to brain-based education and its operational devices. The reasons for the attraction were manifold and multifaceted. Many of the reasons for the attraction replicated the messages about the effectiveness and appropriateness of brain-based education that were propagated by a local and national network of trusted and influential educational actors and agencies, including other practitioners. Thus, two of the three foremost reasons were that brain-based education was considered to be best/good practice and drawing on its putative neuroscientific underpinning, it was seen as innovative and pioneering. A third important reason was that it was believed that its efficacy and/or authenticity had already been established by the trusted sources who acted as the agents in its introductions to the practitioners. Brain-based education and its devices were used in the classroom because it/they were seen to work, or could be adapted to work, or if they did already work could be adapted to work better. Practitioners framed working within the very narrow construct of measurable academic student outcomes i.e. progress or performance. The practitioners felt that what worked was transient and unstable at any given time, meaning that the high adaptability of brain-based education and its operational devices made it supremely useful to them as part of their approach to teaching.

The central research question was *What was the impact of a brain-based education component of a professional development programme on the knowledge and practice of secondary practitioners?* The short answer to this question draws on data from all five themes. The impact of the TEEP-within PD on brain-based education seems to have been somewhat limited. This is because the practitioners had substantively encountered brain-based education prior to their TEEP PD.

Revisiting limitations

The specific aim of any research endeavour along with the unique nature of its given context conspire to generate a cohort of limitations which mediate the extent to which its findings can be applied to other contexts. Although one flows from the other, by necessity, the choice of methodology and methods invokes its own further set of limitations. Unsurprisingly, my research showed no immunity on either of these fronts and as I have already discussed in Chapter 5, there are several limitations in the design of this study. My intention here is not to resurrect this discussion, but rather to revisit it in light of the unexpected asserted novelty of the findings and to explore the extent to which the insights I have developed as a result of these compelling findings may fruitfully and legitimately be applied to other contexts (Hammond & Wellington, 2013).

As I acknowledged in Chapter 5 even before I had collected any data, produced any findings, or derived any insights, the study's most significant limitation was that of its lack of generalisability to the wider population of educators, being as it was, a qualitative inquiry predicated on interpretivism. Rebutting this potential critique, I argued for the applicability of Bassey's (1981) notion of fuzzy generalisability. Fuzzy generalisability provides an assessment of the likelihood or not, that what I have found "will be found in similar situations elsewhere" (Bassey, 1999, p. 12). When I started this research however, I was content with producing a set of findings which would make a respectable and passable if somewhat uncontroversial, contribution to knowledge in the field. As I did not expect the findings to be compelling beyond the context in which they originated, I did not anticipate the matter of generalisability acquiring an additional importance post analysis and interpretation. Indeed, finding out that brain-based education underwent purposeful, heuristic adaptations at the hands of practitioners to elicit utility, where utility was purely framed in terms of its ability to effect and improve measurable academic outcomes, was not something on my 'event-horizon'. Likewise, I did not anticipate finding out that practitioners were uninterested in knowledge about neuroscience per se because it was 'knowing about' whereas they were more interested in ‘knowing that’, or indeed that a significant part of the appeal of brain-based education came from its power to capture the performative imaginations of practitioners.

However, now that I have my data, my findings, and my interpretations, and can see their potential for offering fresh insights into other more distal areas of teacher activity, particularly where new teaching initiatives are implicated, I find myself making a much more animated and less sterile plea for a high level of the fuzzy generalisability of my findings. My view, based on expending a substantial amount of effort in school-facing settings with educators where the focus has been teaching and teaching initiatives, is that these findings have importance beyond the immediate context of brain-based education and the operational environment of Westford LA. To stake a prospective claim for the high fuzzy generalisability that I consider that these findings warrant, as Bassey instructs, I reconfirm that I have reported the data analysis methods carefully (Chapter 7) and provided suitably thick descriptions of the findings (Chapter 8) and given a detailed analytical and interpretive account (Chapter 9). With this array of measures duly executed, I now leave the readership in a place where they can assess for themselves the extent to which I have been successful in fulfilling Bassey’s conditions and thereby determine whether what I have found will be found in similar situations elsewhere (Bassey, 1999).

Final Thoughts

By carrying out this research I sought to understand, from the perspective of those who lead on teaching in an LA struggling with students’ academic standards, the impact that brain-based teaching strategies/methodologies had on their knowledge and practice. Its contribution to the knowledge base is that it has described how and explained why practitioners engaged with contested science that was provided to them as an efficacious solution to improve learning outcomes and teaching quality. It has generated some unusual and unexpected findings that have additional and less proximal explanatory power than just the intersection of brain-based education and Westford LA’s practitioners. The act of conducting this research has brought about some profound changes in myself as a researcher and as a person. In my final reflexive vignette (Example 10.1) I document some of the noteworthy changes.

Reflexive vignette No.4.

In Chapter 5, I wrote that "I have through gone somewhat of a personal paradigm readjustment during my doctoral studies". Now that I have finally reached the end of this research project I realise that this readjustment from positivism to interpretivisim was just the tip of the iceberg. In fact, it is probably quicker to reflect on what has remained constant rather than what has changed about my scholarly thinking, learning and practice as a direct consequence of undertaking this research. On this basis, what has remained as a constant has been my axiological position as outlined in Table 5.1 in terms of personal values, and more broadly, as discussed in Chapter 5 under the heading of *Axiological position* and in Chapter 6 under the heading of *Ethics.* All other fronts have been subject to sustained and substantial challenge.

Retrospectively, in terms of my own knowledge I can now appreciate the extent to which that my initial view of teachers and their enactment of teaching was shallow, naïve, and uninformed. The same can be said about my understanding of policy and especially the policy environment that constituted educators' workspaces and acted as drivers of their teaching behaviours. I am under no illusion that the same is not true for brain-based education and perhaps to a much lesser extent for the obvious reason that I am not a neuroscientist.

Frankly, the at times uncomfortable effect of this research project where by necessity I have had to grapple with confusing ideas of definition and logic across many locales, has been to relocate me from a place characterised by un-nuanced and uninformed knowing and thinking to a place where I now experience a new way of seeing and thinking, a place where the interrelatedness is apparent rather than unknown. To harness the Johari model of self-awareness, I have moved from a place where I didn't know what I didn't know, to a place where at least I know what I don't know. Alternatively, to harness the ideas of threshold concepts (Meyer & Land, 2003) and liminal spaces (Meyer, Land & Cousin, 2006), I spent a very long time in the liminal space transitioning from a state of total confusion and mastery of only simple concepts to a state of only minor misunderstanding and mastery of some "troublesome knowledge" (Meyer & Land, 2003).

Example 10.1: Reflexive vignette No.4

I conclude with the quote from Land, Cousin, Meyer, and Davies (2005), as I fully agree with their assessment of my learning as a consequence of this research, being a:

> [J]ourney or excursion which had intended direction and outcome but [I] will also acknowledge … that there [was] deviation and unexpected outcomes within the excursion; there [was] digression and revisiting (recursion) and possible further points of departure and revised direction. The eventual destination [was not] reached … [it was] revised. It [was] a surprise. It will certainly be the point of embarkation for further excursion (p. 202).

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Appendices

Appendix 4.1: Coda

In Chapter 4 I signalled that the literature review provided was only conducted up to the time that I started my empirical research i.e. April 2013. This didn't impact on my data collection, handling, or interpretation activities. Nonetheless, to reflect the current state of the empirical literature at the time of writing, I now present a brief summation of key relevant published research since April 2013. The post-April 2013 empirical literature on the use and knowledge of brain-based teaching strategies/methodologies by educators shares the same characteristics at its pre-April 2013 counterparts in that it is still somewhat limited and problematic in its nature. I have already discussed these issues at length Chapter 4, so I do not intend to revisit them here or indeed offer any significant added interpretive commentary. Rather, my intention in this coda is to focus on a simple comparison of the post-April 2013 findings with that of this research. I have included the references for this coda in the main reference list.

A significant proportion of the new research, like the earlier research, is orientated towards establishing the prevalence of neuromyths and the level of general brain literacy amongst educators. The research instruments of Dekker et al. (2012) and Howard-Jones et al. (2009), themselves derivatives of each other have been adopted by nine such studies. The key features of these studies are summarised in Table A.1. The tenth study in Table A.1, that of Macdonald, Germine, Anderson, Christodoulou and McGrath (2017) is noteworthy because they corrected many of the methodological issues inherent present in the two aforementioned research instruments and included the Mozart Effect recognising it as a prominent neuromyth. No post-April 2013 research has accounted for the neuromyths underpinning Multiple Intelligence theory or Mind Mapping, even though Simmonds (2014) found that their operational devices were used. Simmonds reported collectively on UK teachers' responses to two online surveys - Schoolzone and The Wellcome Trust's Teacher Survey – where n^{total} = 1200. The respondents came from the full teacher demographic but because of their interest in neuroscience were not considered to be fully representative of all UK teachers. Of the four operational devices she investigated in depth, overlap with this study occurred for VAK theory, Brain Gym® and Brain Laterality.

Study details	Location	Sample size	Respondent type	Main Research instrument
Deligiannidi and Howard-Jones (2014)	Greece	217	Primary and secondary teachers	Howard-Jones et al. (2009)
Karakus, Howard-Jones and Jay (2014)	Turkey	278	Primary and secondary teachers	Dekker et al. (2012) and semi-structured interview of n=5
Pei, Howard-Jones, Zhang, Liu, and Jin (2015)	East China	238	Primary, secondary and high school teachers	Howard-Jones et al. (2009)
Gleichgerrcht, Lira Luttges, Salvarezza, and Campos (2015)	Latin America	3451	Teachers of all levels	Dekker et al. (2012)
Tardif, Doudin and Meylan (2015)	French-speaking Switzerland	283	Teachers, trainee teachers and teacher trainers	Survey about operational devices- VAK theory, Brain Gym® and Brain Laterality
Lethaby and Harries (2016)	US and Canada	128	Teachers of English Language	A merged/ abridged version of Howard-Jones et al (2009) and Dekker et al (2012) focusing on VAK but questions about sources and influences of brain-based education use
Ferrero, Garaizar and Vadillo (2016)	Spain	284	Teachers	Dekker et al. (2012) with minor adjustments supplemented with a series of questions about PD, use and opinions about neuro knowledge
Canbulat and Kiriktas (2017)	Turkey	752	Teachers and trainee teachers	Dekker et al. (2012)
Macdonald et al. (2017)	Worldwide	598	Educators (of whom 53 reported high neuroscience exposure)	Improved version Dekker et al. (2012) Asked about The Mozart Effect neuromyth
Papadatou-Pastou, Haliou and Vlachos (2017)	Greece	573	Prospective teachers: undergraduate and post graduates	Adapted version of Dekker et al. (2012)

Table A.1: Key features of the post-April 2013 studies examining the prevalence of neuromyths amongst educators

I have summarised the findings concerning levels of belief in neuromyths and brain literacy for the nine studies in Table A.2. Some studies reported on other findings in addition to those reproduced in Table A.2. These are discussed later.

Study details	**Belief in Neuromyth (per cent)**					**Brain literacy (per cent)**
	VAK	**Brain Gym®**	**Enriched Environments**	**Brain Laterality**	**10 per cent myth**	
Deligiannidi and Howard-Jones (2014)	97	56	97	71	45	NR
Karakus, Howard-Jones and Jay (2014)	97	72	87	79	50	57
Pei et al. (2015)	97	84	89	71	59	NR
Gleichgerrcht et al. (2015)	91	78	93	74	61	67
Tardif, Doudin and Meylan (2015)	96	Not asked	Not asked	85	Not asked	Not asked
Lethaby and Harries (2016)	88	61	Not asked	66	30	Not asked
Ferrero, Garaizar and Vadillo (2016)	91	78	94	68	44	62
Canbulat and Kiriktas (2017)	NR	NR	NR	97	75	70
Macdonald et al. (2017)	76	81	39	49	33	79
Papadatou-Pastou, Haliou and Vlachos (2017)	96	92	96	92	74	79

Table A.2: The findings for levels of belief in neuromyths and brain literacy for the nine post-April 2013 studies reported in Table 8.1 [Key; NR = not reported]

A statistical meta-analysis by Ferrero, Garaizar and Vadillo (2016) judged the findings of the studies pre-2016 for the levels of beliefs in the individual neuromyths to be very consistent with each other. The post-2016 studies largely follow suit to show that VAK theory appears to be the neuromyth attracting consistently the highest level of belief. In order, the neuromyths behind Enriched Environments, Brain Gym®, Brain Laterality and the 10 per cent myth were the next most widespread. To compare the findings about belief in neuromyths my findings, I adopt the same stance as before. I use them as very crude proxies for two constructs that I am interested in, firstly, as a makeshift proxy (when inverted) for and secondly, as an improvised proxy for the level of awareness there was for each operational device. On the matter of the latter, allowing of course for the fact that not all my neuromyths were tested in the other studies, for those that were, there is a good degree of congruence between the post-April 2013 findings and mine (see Figure 8.1). For the construct of the participants' neuroscience knowledge underpinning each operational device, my findings (see Table 8.2) are only somewhat corroborated with the updated research finding. More exactly, only my findings that VAK theory was the only operational device that was well understood and that equally, the Mozart Effect was only weakly understood, are supported by the new findings. Based on the new research however, I would have expected to find Enriched Environments, Brain Gym®, Brain Laterality and the 10 per cent myth much better understood by the participants. It is my contention that these operational devices are only weakly understood because they are not practiced to any significant degree.

Post-April 2103 findings converged on the matter of whether educators thought that it was important to know about neuroscience to teach effectively. Substantial numbers of respondents across three studies expressed the feeling that neuroscience was important to the improvement of educational practices (Ferrero, Garaizar and Vadillo, 2016; Karakus, Howard-Jones & Jay, 2014; Simmonds, 2014). Similarly, respondents across multiple studies indicated a strong interest in knowing how the brain works; Ferrero, Garaizar and Vadillo (2104) (98.5 per cent), Simmonds (2014) (82 per cent), Karakus, Howard-Jones and Jay (2014) (90 per cent) and Papadatou-Pastou, Haliou and Vlachos (2017) (88.4 per cent). These results mirror pre-April 2013 findings meaning that the opinions of the Westford practitioners - who on balance - were not convinced that even an abridged or functional understanding of neuroscience would improve their teaching efficacy and therefore weren't interested in pursuing it, stand in empirical isolation.

There was no such consensus amongst the studies that produced results concerning brain science knowledge. Simmonds found that 75 per cent of teachers reported knowing only very a small amount or no brain science knowledge. Conversely, for the studies given in Table A.2, assessed levels of neuroscience knowledge varied from 79 per cent to 57 per cent with the majority occurring at the upper end. The equivalent findings for the Westford participants occurred at much lower level and therefore were more line with what Simmonds found.

Only the studies of Ferrero, Garaizar and Vadillo (2016), Lethaby and Harries (2016) and Simmonds (2014) enquired about the sources of knowledge with brain-based education. Ferrero, Garaizar and Vadillo (2016) found that 51.4 per cent of respondents cited the Internet, with the corresponding figures for books and PD being 27.6 per cent and 16.9 per cent respectively. 59 per cent of Lethaby and Harries' respondents said they had received input on brain-based ideas from their PD. Simmonds' (2014) findings were somewhat different, with respondents listing 12 separate sources of knowledge. The two main sources with response rates of just over half the respondents were internal PD (i.e. schools) and other teachers. External PD was the third most cited source. Other sources comprised educational media, conferences, the general media, and popular science magazines - the rarest were academic/scientific journals. In the first instance, all three sets of findings, but especially that of Simmonds' strongly supports my finding that Westford participants had encountered brain-based education from multiple, varied sources on multiple occasions. The further findings of Simmonds in relation to the historic and intended future use of brain-based education that I discuss later further support my findings that such exposures occurred over a substantial timeframe. Secondly, my finding that of these multiple sources, PD was the principal mechanism for acquiring a detailed and working knowledge of the operational devices is also corroborated by the findings of Simmonds (2014) and, Lethaby and Harries (2016).

91 per cent of Lethaby and Harries' (2016) respondents said that the PD on brain-based education influenced their teaching but they were not asked to give any specific details of this occurred. Simmonds' (2014) results are much instructive on this account. Like this study (see Figure 8.1), almost all the respondents were aware of VAK theory, Brain Gym® and Brain Laterality. The order and size of 'current use' was VAK theory at 76 per cent, Brain Laterality at 18 per cent and Brain Gym® at 16 per cent. A pattern of declining use was similarly replicated by Simmonds (2014) – the historic use of VAK theory was cited at 92 per cent, only one per cent below the finding for this study.

Perhaps what is most unique and thus interesting about Simmonds' findings is that there is a striking replication of my findings as they relate to the large-scale adaptation of the operational devices. Whilst there is tangible evidence in her raw data tables that the operational devices are being adapted in ways like or even identical, to those in this research, Simmonds' analysis stops short of my own. Instead of developing this interpretation, she merely observes that "There were examples of teachers using certain approaches … for different purposes or in ways for which they were not originally developed or conceived" (p. 2). For example, Simmonds' respondents, like Westford practitioners used (by presumably adapting them) various operational devices to refocus and re-energise classes, to personalise learning, as lesson starters, to provide episodic lessons and to deliver curricular provision. Again, replicating my findings, mention was also made of the use of VAK theory to train teachers and it seems that the multi-sensory variant of VAK theory was deployed.

The finding that Westford practitioners used brain-based strategies because they believed that they caused an improvement on academic performance was reproduced by Simmonds. Further convergence between the results of this study and that of Simmonds was on the matter of the criteria used by respondents to decide to try out the operational devices brain-based education (or neuroeducation), although it appears that there is divergence in one of the meanings attached to the construct of evidence. Simmonds' (2014) teachers most frequently cited evidence from research (52 per cent) and PD (12 per cent) as being the criteria that would encourage them to try out an operational device. Simmonds' observation that "The value placed on evidence is particularly interesting given that teachers also say that they find out about interventions most often from their school and other teachers, rather than academic and scientific literature" (p. 7) leads me to wonder if her respondents were in fact using the construct of evidence, like my practitioners, to mean anecdotal and unsubstantiated school-based improvement evidence, rather than the findings from rigorous, scholarly inquiry. It is clear that Simmonds' (2014) observations and findings that find ready parallels in this study:

> One respondent clearly summed up what seemed to be common opinions by saying, '…1. Does it work in practice? 2. Is it easy to implement?' When asked what would deter teachers from trying out a new activity or technique, the most frequent responses are a lack of time, the activity being too time-consuming, bureaucratic or complex (31 per cent) and a lack of evidence (22 per cent) (p. 7).

Finally, to draw a comparison of Simmonds' findings with those here, there was also a great similarity between Westford practitioners' references to style over substance and Simmonds' respondents' recognition of "pseudoscience promoted by those who simply wish to sell a technique or idea" and "advertising hype and propaganda" (p. 7). As I have demonstrated, there are many similarities between the two studies, however before I conclude this coda I exercise a word of caution about the various correspondences drawn. As Simmonds prudently caveats, her respondents cannot be taken as being representative of the wider educator population in the UK, or indeed England.

Appendix 6.1: Interview schedule

Interview Schedule to be adjusted accordingly. After introductions & ethics and precautions discussion

1. In brief, can you tell me about your career in education so far?
2. What attracted you to the teaching profession/working in schools?
3. What professional training or CPD have you been on/been involved with during your career so far?
4. Training. Have you been involved in the TEEP project as either a trainer or trainee? If yes, can you elaborate – if no, why not? What initial TEEP training was given to teachers in your school/in the LA?
5. Understanding Can you tell me about the pedagogical ideas in /behind TEEP? What is the TEEP philosophy? What are the key parts of TEEP?
6. Use of TEEP. Do you use TEEP? Is/was TEEP used in your school/other LA schools? If so how, is/was TEEP used by you /other teachers/the LA?
7. Efficacy. What do you personally think about TEEP as an approach to T&L
8. TEEP claims & provenance. How was TEEP presented to you as either CPD or a T&L program? What claims were made about its academic research and classroom evidence base? What do you think about these issues?
9. Other than from me, have you heard of the term brain-based teaching/learning or neuroeducation? If yes, can you elaborate? If no – brain-based means...
10. Show list of AL based brain-based methods. Which of the list are you familiar with?
11. Have you received any training or given any training on any of these brain-based methods?
12. Which of these have you used in your own teaching/training? Which of these do you still use in your teaching/training?
13. Can you explain how you use the brain-based methods you have identified during your teaching.
14. If we looked at your lesson plans would we see any evidence of the use of these brain-based methods?
15. Do you see any of these brain-based methods as being particularly associated with or integral to TEEP? Possibly skip if not involved with TEEP? Can you elaborate on your answer?
16. Do you or have you in the past used any other brain-based methods that we have not already mentioned? How? Would these be indicated on your lesson plans/schemes of work? Can you elaborate on your answer?

17. If you have observed other teachers' lessons, can you explain if and then how you have noticed teachers using any brain-based methods, either TEEP linked or not?
18. If you have looked at teacher's lessons plans during your work, do they show any evidence of the use of brain-based methods?
19. If you have observed teachers' lessons and if the teachers are using brain-based methods do you think the students in the teacher's lessons are aware that their teachers are using brain-based methods?
20. If you are using brain-based teaching methods, would your students be aware? If we asked your students, would they be aware that you are using brain-based methods?
21. Does your school encourage or require you to use brain-based methods? Have you noticed the school encouraging or requiring teachers to use brain-based methods? E.g. on observation checklists or through CPD or schemes of work?
22. Does any other body encourage or require you to use brain-based methods?
23. In your work with other educational organisations, e.g. SNS or consultancy firms or LA have you noticed them encouraging or requiring teachers or schools to use brain-based methods? E.g. on observation checklists or good practice guides
23. How do you think brain-based methods impact on students learning?
24. Do you think brain-based methods have an impact on student attainment?
25. What do you understand by best/good practice? Do you think brain-based methods are best/good/ practice?
26. Why do you think teachers and schools use brain-based methods?
27. Apart from the answers you have already given relating to individual brain-based methods or the reasons you have given relating to schools and teachers, why else do you use brain-based methods?
28. Do you have any other observations/comments about the use of brain-based methods in education more generally?
29. Can you recommend anyone me to interview on this subject?

Appendix 6.2: Ethical approval documentation

Centre for Educational Studies
T 01482 465988
[redacted]@hull.ac.uk

ETHICAL PROCEDURES FOR RESEARCH AND TEACHING
IN THE
FACULTY OF EDUCATION

PERMISSION TO PROCEED WITH RESEARCH: ETHICAL APPROVAL

Reference Number:	12/037
Name:	Jacqueline Elton
Student No:	[redacted]
Programme of Study:	MPhil/PhD
Research Area/Title:	What factors contribute to the use of brain based teaching and learning methods in English secondary schools in a Local Authority which adopts a generic teaching and learning model that draws upon brain based teaching and learning methods? An interpretive case study into the perceptions of key stakeholders
Image Permission Form	N/A
Name of Supervisor:	[redacted]
Date Approved by Supervisor:	8 November 2012
Date Approved by Ethics Committee:	16 November 2012

Appendix 6.2: Documentation pack for participants

This pack contains
- Letter for participants
- Letter for schools
- Consent form for schools
- Interview Schedule

Letter for Participants

Dear Prospective Participant,

You are invited to participate in a research study concerning the phenomenon of brain-based education. You were chosen because I know you or because you have been recommended to me by someone that I have already interviewed. Please read this form and ask any questions you may have before agreeing to be in the study. If you agree to participate, instead I will not ask for any written consent, I will assume your consent is given by your participation.

Background Information
This study is being conducted by Jacqui Elton under the direction of Dr [redacted].
The purpose of this interpretive case study is to describe the use of brain-based teaching and learning methods in English secondary schools and to understand the reasons why English secondary school teachers use brain-based teaching and learning methods. The term 'brain-based methods' is adopted to communicate in an uncomplicated way the operation and scope of 'brain based' as an undifferentiated unit which comprises the entire spectrum of brain-based products, concepts, ideas, neuromyths, theories, techniques, and the like, including those perceived that may not actually exist.

Procedures
If you agree to participate in this study, I would ask you to do take part in an interview that would last for about 60 minutes. If you are a teacher and if you were further willing I would also like to observe one of your lessons and look at some of your lesson plans and schemes of work. If you only want to take part in the interview part of the research that is completely acceptable, and I would welcome any contribution you feel you are able to make.

Risks and Benefits of being in the Study
The study has minimal risks that are no greater than the participants would encounter in everyday life. All data collected about you and your students will be kept confidential and no names or identifying information will be included in the research reports. The potential benefits of your participation would be that you would be assisting yourself, other teachers and researchers in understanding the phenomenon of brain-based education more fully.

Confidentiality
The records of this study will be kept private. In any sort of report that I might publish, I will not include any information that will make it possible to identify individual participants or classes. All participants will be assigned an alpha-numeric code that will be used to compile and organize all subsequent data. Data analysis will be conducted on the basis of the entire sample and with subgroups of gender and presence of identified

special learning need. Research records will be stored securely in password-protected files, and only the researcher will have access to the records. Data will be entered into the researcher's personal computer for organization and analysis, and a back-up copy will be kept on a USB flash drive at the researcher's home. Any paper copies of data will be destroyed once entered into the computer and stored digitally.

Voluntary Nature of the Study

Participation in this study is voluntary. Your decision concerning whether or not you participate will not affect your current or future relations with The University of Hull or your school or me. If you decide to participate, you are free to not answer any question or to withdraw at any time without affecting those relationships or having to justify your decision.

Respondent Validation and Debriefing

I will provide you with a written copy of your interview transcript to enable you to make sure that you feel that the interview has been recorded in a fair and accurate manner. At the end of the research I will provide you with a brief summary of the research findings.

Contacts and Questions

You may ask any questions you have now or at any time during the study, you are encouraged to contact me in one of the following ways:

• Mail: Centre for Educational Studies, University of Hull, Cottingham Road, Hull, HU6 7RX.

• E-mail: [redacted]

You may also contact my advisor, Dr [redacted] in one of the following ways at the Centre for Educational Studies, University of Hull, Cottingham Road, Hull, HU6 7RX. Tel: [redacted]. E-mail: [redacted]

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), you are encouraged to contact the Secretary to the Faculty of Education Ethics Committee, Mrs [redacted], Centre for Educational Studies, University of Hull, Cottingham Road, Hull, HU6 7RX.Email: [redacted] Tel. [redacted]

You will be given a copy of this information to keep for your records.

Jacqui Elton

Letter for Schools of Participants

Dear Head teacher,
<u>Research project on the application of brain-based teaching and learning methods in English Secondary Schools</u>

One of your teachers has indicated to me that they would be willing to participate in a research study concerning the phenomenon of brain-based education that I am conducting based at The University of Hull. The teacher was chosen because I know them from when I used to work in the School Improvement Service at [redacted] LA or because they have been recommended to me by someone that I have already interviewed. The teacher's name is [redacted]. For the research project I am interviewing a small number of teachers and then conducting a lesson observation and/or looking at their lesson plans to ascertain what and how brain-based teaching methods are used by teachers, and then conducting a brief follow up interview. In order to I complete the research am asking your permission to be able to observe [redacted] teach and to look at some of their lesson plans.

Background Information
This study is being conducted by Jacqui Elton under the direction of Dr [redacted].
The purpose of this interpretive case study is to describe the use of brain-based teaching and learning methods in English secondary schools and to understand the reasons why English secondary school teachers use brain-based teaching and learning methods. The term 'brain-based methods' is adopted to communicate in an uncomplicated way the operation and scope of 'brain based' as an undifferentiated unit which comprises the entire spectrum of brain-based products, concepts, ideas, neuromyths, theories, techniques, and the like, including those perceived that may not actually exist.

Procedures for participants
For each teacher there will be an interview that would last for about 60 minutes, lesson observation/s and a review of lesson plans. Teachers can opt not to have the lesson observation or lesson plan review part of the research. [redacted] has indicated that they would like to be involved in all aspects of the research.

Risks and Benefits of being in the Study
The study has minimal risks that are no greater than the participants would encounter in everyday life. All data collected about the teacher, the school and the students will be kept confidential and no names or identifying information will be included in the research reports. The potential benefits of allowing the research to go ahead in your school would be that you would be assisting yourself, other teachers and researchers in understanding the phenomenon of brain-based education more fully.

Confidentiality
The records of this study will be kept private. In any sort of report that I might publish, I will not include any information that will make it possible to identify individual schools, participants or classes. All participants will be assigned an alpha-numeric code that will be used to compile and organize all subsequent data. Data analysis will be conducted on the basis of the entire sample and with subgroups of gender and presence of identified special learning need. Research records will be stored securely in password-protected files, and only the researcher will have access to the records. Data will be entered into the researcher's personal computer for organization and analysis, and a back-up copy will be kept on a USB flash drive at the researcher's home. Any paper copies of data will be destroyed once entered into the computer and stored digitally.

Voluntary Nature of the Study
Participation in this study is voluntary. Your decision concerning whether or not you participate will not affect your current or future relations with The University of Hull or your school or me. If you decide to participate, you are free to withdraw at any time without affecting those relationships or having to justify your decision.

Respondent Validation and Debriefing
Teachers will be provided with a written copy of their interview transcript to enable them to make sure that they feel that the interview has been recorded in a fair and accurate manner. At the end of the research I will provide you and them with a brief summary of the research findings.

Contacts and Questions
You may ask any questions you have now or at any time during the study, you are encouraged to contact me in one of the following ways:

• Mail: Centre for Educational Studies, University of Hull, Cottingham Road, Hull, HU6 7RX.

• E-mail: [redacted]

You may also contact my advisor, Dr [redacted] in one of the following ways at the Centre for Educational Studies, University of Hull, Cottingham Road, Hull, HU6 7RX. Tel: [redacted]. E-mail: [redacted]

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), you are encouraged to contact the Secretary to the Faculty of Education Ethics Committee, Mrs [redacted], Centre for Educational Studies, University of Hull, Cottingham Road, Hull, HU6 7RX.Email: [redacted] Tel. [redacted]

Thank you in advance for your co-operation in this manner.
Jacqui Elton

The FACULTY OF EDUCATION ETHICS COMMITTEE
CONSENT FORM – For Institutions/Organisations
(to be completed by the person legally responsible) (delete italics before use)

I, ... of ....

Hereby give permission for ....

to be involved in a research study being undertaken by

Jacqueline Elton

and I understand that the purpose of this interpretive case study is to describe the use of brain-based teaching and learning methods in English secondary schools and to understand the reasons why English secondary school teachers use brain-based teaching and learning methods. The term 'brain-based methods' is adopted to communicate in an uncomplicated way the operation and scope of 'brain based' as an undifferentiated unit which comprises the entire spectrum of brain-based products, concepts, ideas, neuromyths, theories, techniques, and the like, including those perceived that may not actually exist.
and that involvement for the institution means the following: -
Nominated teacher/s names:

Allowing the researcher to interview & observe the nominated teacher/s and to review the nominated teachers' lesson plans on a maximum of two separate occasions. The teacher nominated has already given their personal consent for the above procedures to take place. For your information the information letter sent to them is attached.

I understand that:
1.the aims, methods, and anticipated benefits, and possible risks/hazards of the research study, have been explained to me.

2.I voluntarily and freely give my consent for the institution/organisation to participate in the above research study.

5.I am free to withdraw my consent at any time during the study, in which event participation in the research study will immediately cease and any information obtained through this institution/organisation will not be used if I so request.

3.I understand that aggregated results will be used for research purposes and may be reported in scientific and academic journals.

I agree that:

4.The institution/organisation MAY/MAY NOT be named in research publications or other publicity without prior agreement.

5.I / We DO/DO NOT require an opportunity to check the factual accuracy of the research findings related to the institution/organisation.

6. I/We EXPECT/DO NOT EXPECT to receive a copy of the research findings or publications.

Signature: Date:

The contact details of the researcher are:
Mail: Centre for Educational Studies, University of Hull, Cottingham Road, Hull, HU6 7RX.
Phone: [redacted] E-mail: [redacted]

If you have any concerns regarding this research, the contact details of the secretary to the Faculty of Education Ethics Committee are Mrs [redacted], Centre for Educational Studies, University of Hull, Cottingham Road, Hull, HU6 7RX.
Email: [redacted] Tel. [redacted].

Anticipated Interview Schedule
After introductions & informed consent discussion

1. Can you tell me about your career in education so far?
2. What attracted you to the teaching profession/working in the LA/ working in schools?
3. What professional training have you been on/been involved with during your career so far?
4. Is TEEP used in your school/is TEEP used in the schools you support in?
5. Have you been involved in the TEEP project?
6. If yes, can you elaborate – if no, why not?
7. Can you tell me about the ideas in/behind TEEP?
8. Have you heard of the term brain-based teaching/learning or educational neuroscience?
9. If yes, can you elaborate? If no – brain-based means XXX. Give list of brain-based methods.
10. Which of the list are you familiar with?
10. Do you think there are any brain-based methods advocated by TEEP? Can you elaborate on your answer?
11. Do you use any brain-based methods from TEEP in your teaching?
12 Do you use any brain-based methods from any other sources? Can you elaborate on your answer?
13. Can you explain how you use the brain-based methods you have identified during your teaching.
14. If we looked at your lesson plans would we see any evidence of the use of brain-based methods?
15. If we asked your students, would they be aware that you are using brain-based methods?
16. Do you think brain-based methods improve student learning?
17. Do you think brain-based methods improve student attainment?
18. Does your school encourage or require you to use brain-based methods?
19. Does any other body encourage or require you to use brain-based methods?
20. Why else do you use brain-based methods?
21. Do you have any other observations/comments about the use of brain-based methods in education?
22. Can you recommend anyone else for me to interview on this subject?