

THE PHENOMENON OF LEARNING
AND APPLYING ANATOMY
FOR PODIATRY PRACTICE

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ABSTRACT

Anatomy is an important component of pre-registration healthcare courses, and much research has been undertaken into how and when it is taught and assessed, largely measured in terms of student performance. No such research base exists regarding the student perspective of this experience. This study used the lived experience of podiatry students when learning anatomy, and applying and developing that learning in clinical practice, to gain insights into the phenomenon of learning and applying anatomy.

Adopting some of the principles of Husserlian phenomenological philosophy, this study was conducted using a modified descriptive phenomenological methodology as proposed by Amadeus Giorgi. During a three year pre-registration programme, three students were interviewed following the completion of their first year anatomy module, after two scheduled year three clinical sessions, and after a final learning encounter in the dissection room.

Analysis of the interview transcripts revealed the structure of the lived experience to consist of eight constituent parts: 1) assuming a learner-ready attitude, 2) employing patterns of behaviour, 3) (de)constructing anatomy, 4) a sense of reality for or from practice, 5) solving clinical problems, 6) working alone, with resources, and through and with others, 7) recognising (in)competence in self and others, and 8) reflecting and acting on experience. I have offered plausible and thoughtful insights for anatomy teachers in podiatry and for others in healthcare education, with the intention that this common structure may resonate with them and that they can have a shared familiarity.

The constituent parts have then been formulated into a model of learning anatomy. The model shows that the student experience of learning and applying anatomy is a process comprised of three sequential stages: making sense, making meaning and working with meaning, and is mediated by reflection.

These findings will help teachers of anatomy for podiatry to facilitate learning, and may be transferrable to other healthcare professions in which anatomy is a component. Recommendations are made for anatomy teaching and learning practices in both theory and clinical settings. The recommendations will help to enable students to make sense, make meaning, work with meaning, and develop their skills of reflection throughout their education for professional clinical practice.

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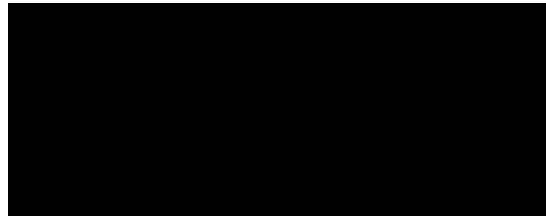
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DECLARATION

I declare that the research contained in this thesis, unless otherwise formally indicated within the text, is the original work of the author. The thesis has not been previously submitted to this or any other university for a degree, and does not incorporate any material already submitted for a degree.

Signed:



Dated: 10th December 2019

1.0 INTRODUCTION

The aim of this study was to determine and describe the phenomenon of learning and applying anatomy as a lived experience. The purpose was to reveal the ways in which podiatry students make sense of anatomy learning and how they use it in clinical practice. Research of anatomy in podiatry education is scarce, and medical research has largely concentrated on the teaching of anatomy or the student perception of that teaching. There is little current debate regarding the phenomenon of learning and applying anatomy. This research will therefore expand thinking around the pedagogy of anatomy in healthcare practice. The research question was: what are the lived experiences of podiatry students learning and applying anatomy?

In this study, learning refers to an engagement with anatomy subject resources, and the manner in which the student processes information. Mediated learning can occur across multiple situations, with most teaching taking place in the classroom, dissection room, and through the clinical experiences encountered. Learning activities are to gain anatomical theoretical knowledge and conceptual understanding, the acquisition of cognitive (anatomical decision making, problem solving) and practical (musculoskeletal, vascular and neurological patient assessment) clinical skills, and develop the values and attitudes commensurate with a healthcare practitioner. This corresponds with Merriënboer's definition of learning as referring to "the act, process, or experience of gaining knowledge, skills, and attitudes" (van Merriënboer, 2016 p.15).

Phenomenology seeks to understand how a person experiences a 'given', through their consciousness of that given, and from their perspective (Giorgi 2009). The phenomenon investigated in this study was learning and applying anatomy. Anatomy theory is taught in the classroom and through dissection and, in the case of healthcare professionals, the application of that theory takes place in the clinical setting. However, there is cross-over. Students can apply anatomy learning in the classroom when real situations are used in teaching. Equally, they can be taught anatomy theory in the clinical setting through patient interaction. The phenomenon is therefore of 'learning and applying', rather than 'learning anatomy, and its application to practice'.

The definition of experience, as specified by Benner (2001), is that repeated exposure to clinical events refines a student's preconceived ideas about knowledge and theory and builds on them for the future. Students make meaning through interpreting their experience (Moon, 1999). The lived experience is a term used to mean the examination and understanding of the meaning of everyday experiences (Van Manen, 2016). I was interested in what is it like

to be a student in the classroom, dissection room and clinical environment, learning the anatomy they are told they need and trying to make sense of it for understanding. I also wanted to understand how they translated their classroom learning into its application in the clinical setting. This study was therefore an enquiry into the meaning of students' everyday experiences of learning and applying anatomy.

The literature on medical students and anatomy is extensive and offers a comprehensive view of the status of anatomy education for the physician. Anatomy for podiatry has its history in a medical curriculum; indeed the podiatry curriculum was founded on the medical model. It could therefore be expected that those aspects that medical students find advantageous or problematic might resonate with the podiatry profession. Of the medical discourses, my interest was on the importance of anatomy in clinical practice and the extent of anatomy expected of graduating clinicians. I also focused on the use of cadavers in teaching anatomy, how the learning of anatomy is considered best achieved through other mediated teaching methods, and the ways in which students acquire anatomy knowledge. This introduction will therefore draw upon these discourses and apply them to podiatry.

1.1 Anatomy and its importance in podiatric clinical practice

Anatomy is a scientific knowledge of the living form (Yammine and Violato, 2016). Knowledge of human anatomy is one of the oldest of the medical disciplines and a foundation of medical clinical practice (McLachlan and Patten, 2006). Anatomy knowledge for podiatrists could therefore be considered fundamental to the delivery of effective foot healthcare. It is used to examine the lower limb, understand and interpret the findings from clinical assessment, and determine the origin of a patient's complaint (Frowen et al., 2010). It is also sometimes used to read and interpret complex clinical investigations such as X-rays and scans (Davies and Pettersson, 2002). Knowledge of the normal structure and function of the body is considered essential for understanding the abnormal (Cihak, 2013).

Anatomy is taught in a variety of ways for a range of educational reasons. Surface anatomy is the identification of structures by knowing what is beneath the skin through methods such as palpation. Podiatrists can feel for pulses to assess blood flow, or for bony landmarks to detect bone size and joint position. Topographic anatomy is the detailed study of structures and their relation to those around them. The foot can be learnt in this way by examining, for instance, the first large toe joint: what structures are in the area, how it is supplied with blood, what nerves situated there stimulate the muscles and how this arrangement brings about the joint's movement. Regional anatomy incorporates topographical anatomy and is the study

of the body by segment. Musculoskeletal anatomy for podiatrists is often taught by this organisation, as the lower limb is naturally divided into compartments. Functional anatomy is the study of the body in action, and podiatry students learn this as it applies to the foot and lower limb, particularly through the study of human locomotion. Anatomy can also be taught by system, there being eleven in the body, and this can be more appropriate for structures which are distributed throughout the limb. The circulatory and nervous systems can be studied in this way. Surface, topographical, regional, systems approach and functional anatomy are all ways of conceptualising the subject to teach the anatomical form and would make perfect educational sense to the anatomy teacher who has experience of clinical practice. But what sense does a student make of them? It is my assumption that early in their education they might be experiencing anatomy as a series of parts and may not have a conceptual understanding of the whole. They would hear words and terms, see muscles and nerves, and touch their own bodies for clues, but these are disparate pieces of sensory information. As most students have never worked in a podiatric setting, I would expect that they have yet to experience the significance of their learning.

1.2 The extent of anatomy knowledge expected of graduating podiatrists

Podiatry students learn anatomy early in their programme, and by graduation they should have acquired a sufficient understanding of the structure and function of the lower limb to inform their clinical assessment practices, develop skills of differential diagnosis, and plan the appropriate management of a podiatric patient. How much anatomy knowledge is actually needed for effective professional podiatric practice?

Podiatry was originally taught as a three year diploma and was a largely skills based course. Podiatry as a bachelor degree in science, and later with honours, started in the early 1990s and was based on the medical model whereby medics were taught basic sciences in the pre-clinical years, and applied them several years later (Smith and Mathias, 2011, Swamy et al., 2014, Torralba et al., 2015). There are currently thirteen undergraduate courses in podiatry in the UK, and it is possible that the anatomy teachers all educate their students using different curricula and assess to dissimilar levels of knowledge. Podiatry is regulated by the Health and Care Professions Council (HCPC) who also regulate 16 other professions (Health and Care Professions Council, 2018). All degree programmes approved by this statutory regulatory body have to comply with the generic HCPC Standards for Education and Training (Health and Care Professions Council, 2017). Podiatry must also comply with the subject specific Standards of Proficiency for Chiropodists/Podiatrists (Health and Care Professions Council, 2013). This provides podiatry schools with a means to gain HCPC

approval and ensure their graduates are fit for practice. Currently the only specification for anatomy within the Standards of Proficiency for Chiropodists/Podiatrists is to “understand, in the context of chiropody and podiatry, anatomy and human locomotion” (Health and Care Professions Council, 2013). There is no mention of anatomy in the generic Standards. Consequently, there is little guidance for curriculum designers and for anatomy teachers specifically. So how do anatomy teachers decide what specific anatomy content, nature and depth to teach podiatry students, and what is the rationale for this decision?

There has been an attempt to produce a core anatomy curriculum for medicine, but consensus has not been reached regarding the depth and detail a student must achieve to be deemed as having the required knowledge (Bergman et al., 2011, Swamy et al., 2014). The Anatomical Society, whose “aims are to promote, develop and advance research and education in all aspects of anatomical science” (Anatomical Society, 2016) produced a core syllabus for medicine in 2003, refined in 2007 (McHanwell et al., 2014), and refined again in 2016 (Smith et al., 2016). This newest core syllabus is reported to be the most informed and modern, comprising a comprehensive directory of anatomy required by newly graduated doctors.

Does this new syllabus for medics offer any support to the educators of podiatry? The most recent core syllabus (Smith et al., 2016) has 22 learning outcomes for the lower limb, nine of which relate directly to the foot. The learning outcomes require familiarity of the bones, descriptions of the hip, knee, ankle and subtalar (between the heel bone and lower bone of the ankle) joints and their movements, and knowledge of corresponding ligaments. Other outcomes detail arteries and pulses, veins, and nerves of the lower limb, ankle and foot. Swamy et al. (2014) developed core orthopaedic anatomy components for medical students. They produced similar outcomes as Smith et al. (2016) for the lower limb, circulatory and neurological systems, however they did not even feature the foot. My assumption is that musculoskeletal knowledge of the hip, knee, ankle and foot, and systems knowledge of vessels and nerves are all necessary for a podiatrist’s understanding of human movement and systemic health and disease. But if I were to ask podiatry students, or indeed graduates what anatomy they thought they needed, what response might I receive and would it align with my own?

The anatomy curriculum for podiatry students at the University of Brighton is largely decided through experience of the anatomy teacher, and discussion with colleagues and clinicians (Birch et al., 2012). This is not an extraordinary method of choosing how much to teach and when to teach it (Evans and Watt, 2005, Bergman et al., 2011). But to deliver this

much anatomy in a podiatry curriculum is a challenge, and the volume of anatomy knowledge expected has the potential to overwhelm a podiatry student early in their course (Alpern et al., 2011). To help address this, there has been a deliberate shift at Brighton away from expecting students to learn detailed anatomical structure, towards helping students understand the principles and mechanisms of anatomy, and how it functions (Miller et al., 2002). The reason is twofold. Firstly, anatomy does not always appear in reality as it is illustrated in the texts. Students need to appreciate that the patient presenting to them may not have the same anatomy as their Gray's Anatomy text book (Drake et al., 2008), or their latest downloaded App. Anomaly is far more frequent than students might expect (Willan and Humpherson, 1999, Ghosh, 2017) and they need to think more conceptually (Miller et al., 2002). Secondly, many patients are complex and present with unusual symptoms. Students will not necessarily find these in their books or have prior experience of them, and therefore need to take a more principle-based approach (Bergman and de Goeij, 2010). So how might a student experience the acquisition of this anatomical knowledge?

1.3 Teaching Anatomy

During the course of the last 20 years there has been a marked increase in the publication of research into the teaching of anatomy. A diversity of strategies is presented, suggesting that there is not a single method which will enable learning, but a complex array of techniques for every type of learner and every approach to learning (Sugand et al., 2010, Johnson et al., 2012, Estai and Bunt, 2016). Students can be taught anatomy through the established pedagogy of cadaver dissection (Granger, 2004, Winkelmann, 2007, Pather, 2015, Ghosh, 2017). Many authors have introduced innovative new ways to compliment learning (Choudhury et al., 2010, Finn and McLachlan, 2010, Stetzik et al., 2015), changed the way they teach (Oh et al., 2009, Ghosh, 2017), and addressed modern technology and its use in anatomy teaching (Cooper and McConnell, 2000, Rizzolo et al., 2002, Jaffar, 2014, Lewis et al., 2014, Hennessy et al., 2016). Published papers report on successes in terms of student achievement and progression, but very few studies have investigated how the students have experienced the teaching strategies adopted and whether or not these strategies have helped students to make meaning of anatomy in the clinical context.

1.31 The use of cadavers in teaching anatomy

Dissection as a means to understand the human body has been used since Aristotle (384-322 BC). Dissection for teaching students of medicine began with Mundinus of Bologna at the start of the 15th century (Ellis, 2001) and gained popularity through the demonstrations of

William Harvey (1578-1657) who gave medical students the opportunity to learn by observation (McLachlan and Patten, 2006). With increased acceptance of the practice of dissection, there was a surge in demand for bodies, and grave robbing became common (Dyer and Thorndike, 2000). The Anatomy Act of 1832 was therefore established which brought in licensing of dissection activity and a bequeathal arrangement (Irish Statute Book). It is thought that by the 20th century every medical school in the world was using dissection as the main means to teach anatomy, but since the advent of technology this number has been dropping (Ellis, 2001).

Anatomy for podiatry at Brighton has historically been taught using cadavers. Dissection is the separation of tissues from one another using a scalpel blade and other surgical instruments. It is performed to examine the human form and understand the relationships of structures to each other. A cadaver, an embalmed human body, provides an opportunity for podiatry students to discover the detail of the human foot and lower limb first hand. It is three dimensional and is therefore a means to feel the surface, get through the skin and discover the deeper tissues (Ghosh, 2017). It is a tactile activity and students develop dexterity skills in their exploration of structures; useful skills for their podiatric practice (Ellis, 2002, Lempp, 2005, Johnson et al., 2012). At the peak of its use in the podiatry curriculum at Brighton for teaching regional anatomy, dissection made up half of the teaching hours. This engaged them with real anatomical structures, associations between the parts, and appeared to satisfy curious minds. But through module evaluation data, it was not so for every student, around a quarter finding the practice unpleasant and unhelpful for their learning. Most students of podiatry do not become surgeons, and only ever see underneath the skin in clinical practice in wound care and toenail removal procedures. So I have reflected on whether it is truly necessary to ask them to cut into real bodies in order to learn anatomy for practice. Studies in both podiatry and medicine have been conducted that advocate dissection as a useful strategy to help students learn (Weir and Carline, 1997, Lempp, 2005, Smith et al., 2017), and with their motivation to learn anatomy (Smith and Mathias, 2007, Smith et al., 2014, Abdel Meguid and Khalil, 2017). Few have asked what the students themselves say about learning anatomy through dissection. Does it help them make meaning of the learning and enable them to apply it to the care of the person with lower limb pathology? And what of the psychological impact of learning anatomy using cadavers?

I have taught students who are enthusiastic about the experience, say they have acquired knowledge of anatomy through it and who exhibit deep engagement with that learning. Equally I have had students who become tearful during the session as they remember that

there is a real person in front of them, refuse to enter the room because of the smell or the remembrance of relatives who have died, or they simply disengage with learning because they find the whole experience too unpleasant. These latter reactions are supported by Weir and Carline (1997) who published a short paper discussing the perceptions of dissection practice by podiatry students. They found that of the 40 participants, 23 experienced negative and unpleasant thoughts and 3 found the sessions too disturbing to be worthwhile. Even so, 37 participants thought dissection was useful to their learning. So why do I continue to use dissection in my teaching and can I mitigate against some of these negative experiences?

Dissection can incite the senses in ways a book or computer could never do (Rizzolo et al., 2002). It is some students' first encounter with death, and can provoke complex emotions (Dyer and Thorndike, 2000, Parker, 2002, Hancock et al., 2004, Böckers et al., 2014). Students can be encouraged to talk openly about the donation, embalming and cremation aspects, and about the disquiet they may feel about performing a complete destruction of a human body. Netterstrøm and Kayser (2008) found that students were not encouraged to discuss their reactions to dissection, which left them understanding that anxiety and emotion were part of becoming a doctor and should be coped with privately. But working with cadavers is a chance for students to engage with the body in a variety of ways and reflect on the experience. They often question their own sense of mortality, and are appreciative of a donors' generosity in assisting them in this exploration (Weir and Carline, 1997, Pawlina and Lachman, 2004, McNamee et al., 2009, Robbins et al., 2009, Böckers et al., 2014).

Learning anatomy through cadaver dissection can be both enlightening and problematic (Snelling et al., 2003, Netterstrøm and Kayser, 2008, Tseng and Lin, 2016). The medical literature has yet to reveal an established link between learning through the dissection of a cadaver and the effective application of that learning to clinical practice (Sugand et al., 2010, Ghosh, 2017). My interest was in talking with the consumers of this education to ask them about their lived experience of dissection, and discovering the ways in which dissecting a cadaver enables or not their anatomy learning, and putting that learning into clinical practice.

Some anatomy teachers are reducing teaching by dissection or abandoning it altogether in favour of prosection. Prosection is the study of cadaveric material already dissected (Estai and Bunt, 2016). It can also be an intimate and first-hand experience and facilitate the learning of anatomy through tactile means. Again it is a three dimensional method of visualising anatomy and unlike the student-dissected cadaver, if expertly dissected the prosection can be used repeatedly and for many years. I now teach about the thigh and gluteal (buttocks) region using prosection. Critics of prosection write that students who learn solely

through this method are denied the opportunity of a tactile experience of learning anatomy, and they lack any emotional engagement with the activity (Fruhstorfer et al., 2011). But my students engage in dissection from the knee downwards, so experience both prosection and dissection. This may or may not come out in the descriptions of their lived experiences at the interview and data analysis in this study. Chapman et al. (2013) evaluated Leeds medical students' perceptions of different teaching methods (dissection, prosection, lectures, models, computer packages, living and radiological anatomy) using a scoring mechanism. Dissection and prosection scored the highest in 5 out of 9 categories, and scored significantly higher overall. Davis et al. (2014) asked 370 pre-clinical medical students from Bristol a similar question, and they also largely favoured cadavers even though they did not have much opportunity to learn this way. These two papers are not alone in arguing that dissection is still a highly rated method for medical students to learn anatomy (Winkelmann, 2007, Fillmore et al., 2014, Ghosh, 2017). But is this the case for podiatry students?

The use of dissection and prosection in anatomy education is hotly debated (Estai and Bunt, 2016, Ghosh, 2017). There would appear to be a dichotomy between those anatomy teachers who consider it indispensable (Pather, 2015) and those who consider other, often cheaper and certainly more accessible methods to be as good (Sugand et al., 2010). One tenet of the argument is the use to which a student will put their anatomy once they have graduated. At one end of a spectrum the surgeon will need intricate anatomical knowledge of a part, whereas at the other, a psychiatrist will need little anatomical knowledge (Fitzgerald et al., 2008). I would argue that podiatrists need something in between, but it may be related to the context in which they practice podiatry. It was therefore interesting to understand how the experiences of learning anatomy influenced students in the applied setting.

1.32 Other mediated teaching methods

A large number of pedagogies other than dissection/prosection have been proposed in the literature to encourage effective learning of anatomy. The discourses on multimodal methods of curriculum delivery have made me reflect on my own teaching practices. Over the past decade I have employed more modern teaching methods which aim to promote learning, and don't simply teach. My belief is that students of podiatry should be encouraged to be more proactive in their learning by engaging in reflective thinking (Moon, 1999, Chan, 2015), becoming more independent in their learning (Dornan et al., 2005, Findlater et al., 2012, McGrath et al., 2015, Whelan et al., 2016) and conducting more of their own self-directed study (Arroyo-Jimenez et al., 2005, Murphy et al., 2014). My approach to classroom

teaching has developed with these student learning needs in mind and it is therefore of interest to me to know how the students engaged with these strategies.

I suspect anatomy teachers adopt strategies that resonate with their own ideas about learning and with their own expertise to deliver on that strategy. For instance, teachers who enjoy social media may try to incorporate it in their teaching, others who like drawing and modelling may feel this is a good way to learn. I also incorporate teaching practices into my classroom according to how I like to learn and what I feel comfortable using to teach.

Oh et al. (2009) incorporated clay modelling into their anatomy curriculum to help students understand cross sectional anatomy. They would make a model, slice it, and compare it to a CT scan or MR image. This was reported as a successful learning strategy in terms of satisfaction of the learning experience and for knowledge tests immediately after the module. Interestingly the test six months later did not produce a statistically significant improved result. However, a bi-product of their findings was that it helped students convert two dimensional images to understanding structures in three dimensions. At Brighton students use plasticine to model the muscles of the plantar surface of the foot and attach them to a plastic skeleton. They can see how each muscle connects with bone, the relationship of one muscle with another, and the overall complexity of the four layers of muscles in the foot. They cannot slice it, as for the Oh et al. (2009) study, but they can get a sense of the whole.

To introduce enjoyment and motivation into learning and teaching anatomy, I provide games and quizzes for the students to work together and draw on their anatomy knowledge to answer the questions. Howard-Jones et al. (2016) examined gamification as a means to reduce internal distraction, what they termed 'mind wondering', and enhance educational learning. They found there was a positive effect of game-based activities on learning by an unconscious deactivation of these internal thoughts. Choudhury et al. (2010) investigated the impact of regular interactive games (anatomy Bingo and anagrams) on summative examination results for first year optometry students. They discovered the results improved significantly, not only against previous years but also for that module compared to all the others in their first year. Stetzik et al. (2015) also used a puzzle-based pedagogy comparing it to a solely lecture based delivery, and discovered the students showed a significant improvement in performance on course specific assessments. Both of these studies were researching impact on student achievement, a valuable piece of information but not one to offer insight into whether these students enjoyed their games, considered they were the factor that improved their achievement of the learning outcomes, or facilitated information retrieval.

There is reported merit in students finding alternative methods of communicating learning other than essays and tests, for instance making models, drawings and illustrations. Noorafshan et al. (2014) evaluated the use of sketching as a means to communicate their learning. Students reported being engaged and active in their learning and said it increased their motivation to learn the subject. I ask my podiatry students to perform formative tasks over the module period, communicating their learning through making a model or drawing some anatomy and annotating the diagram. Finn and McLachlan (2010) advocate body painting as a means to increase enjoyment, assist with recall, and help students visualise anatomy through the surface of the skin. This has the potential to help a podiatry student understand surface anatomy. For example, by drawing the course of arteries and nerves around the back of the ankle bone and into the foot they can appreciate the mechanism by which blood is delivered to the toes and the safe practice of anaesthetising the foot for skin and nail surgical procedures.

I have mentioned a few more innovative ways of teaching anatomy, but I do also teach using the conventional method of PowerPoint presentations. These are still one of the main methods of conveying anatomical information in the classroom (Carmichael and Pawlina, 2000, Sugand et al., 2010, Ghosh, 2017). I often capture these presentations on video using screen-capture software (Silva, 2012) so a student can re-watch the recorded presentation and are reminded of the discussions that took place at the time. Through module evaluation my students tell me this is useful. I encourage my students to prepare before the session by providing the PowerPoint in advance, allowing us to explore the content in other interesting ways (Estai and Bunt, 2016, Ghosh, 2017). For example the students can use the contact time to practice on each other, they can ask relevant and often pre-prepared questions, they can share knowledge through small group work, and they can discuss how the anatomy they are learning can be applied to podiatric practice. These interactive sessions have the potential to foster a deeper approach and motivation to learn anatomy (Marton, 1981, Smith and Mathias, 2010, Ghosh, 2017), engage critically with the subject material (Ramsden, 1992) and adopt a reflective attitude to learning (Moon, 1999, Brockbank and McGill, 2007, Marshall, 2008, Chan, 2015). These are all outcomes I wish for my students as by-products of learning anatomy, and to underpin and support the curriculum for the undergraduate degree. But does this strategy work and does it assist my students to learn anatomy for the effective practice of podiatry? Evaluation is a useful tool but fails to reach the depth of understanding of this phenomenon. I wanted to get to the core of their experiences of the learning strategies I have chosen for my classroom and the application of that learning in the clinical environment.

Vázquez et al. (2007) points out that PowerPoint has only been used in anatomy education for the past twenty years, since the common usage of the computer. This is about as long as I have been teaching. However, as with classroom pedagogy in many other subjects, the presented lecture is being supplemented by modern technology, and other mediated teaching methods. On line activities are now used to supplement learning (Rizzolo et al., 2002, Biasutto et al., 2006, Tam et al., 2009, Estai and Bunt, 2016). Rizzolo et al. (2002) demonstrated that the provision of regular on line course materials, particularly self-testing mechanisms, helped students to gain enhanced examination results and recommended that these be made available on all course virtual learning sites. But these only address improved outcomes for students on module assessment and do not consider if that learning is lasting or if they can use that learning in practice. Web based packages (Cooper and McConnell, 2000, Thomas et al., 2011, Johnson et al., 2013) have largely been designed to reproduce anatomical structures to support learning anatomy. Cooper and McConnell (2000) evaluated a web-based learning tool as a method of facilitating self-directed learning in physiotherapy students. The authors discovered that students held positive views about the tool and, providing it did not replace face-to-face contact with tutors, they welcomed it as an informal learning technology. More recently, mobile apps (Mayfield et al., 2013, Lewis et al., 2014), and learning involving Facebook (Jaffar, 2014) and Twitter (Bahner et al., 2012, Hennessy et al., 2016) are being used to supplement classroom learning. Personally I do not engage with these social media and therefore do not use them in my teaching, but I am aware that my students choose to use Apps and Facebook to learn anatomy to complement our classroom activities, so my assumption is that they aid learning for some students in some way. While these computer-based methods have the potential to enhance learning and encourage independence (Trelease, 2002), studies have shown that students still prefer dissection, lectures and textbooks (Cooper and McConnell, 2000, Rizzolo et al., 2002, Davis et al., 2014, Abdel Meguid and Khalil, 2017). My study offers insight into how students use these methods, how they acquire the necessary knowledge of anatomy, and whether they are enabled to make sense of anatomy for effective clinical practice.

1.4 Podiatry students' acquisition of anatomy knowledge

It could be argued that to make any sort of meaning out of anatomy education, and to use that understanding in practice effectively, time needs to be spent on acquiring knowledge. This is particularly relevant of terminology, and its easy recall (Eizenberg, 1988, Miller et al., 2002, Wilhelmsson et al., 2011, Bergman et al., 2013a).

Anatomy as a subject is characterised by the necessity to learn a vast new language of medical terminology (Netterstrøm and Kayser, 2008, Wilhelmsson et al., 2010, Wilhelmsson et al., 2011). Retrieval cues (mnemonics and repetition) and retrieval pathways (connections to prior knowledge) may help students remember and contextualize anatomy (Wilhelmsson et al., 2010). If students are able to recall facts easily, then theoretically they can concentrate their efforts on gaining deeper understanding. Research has shown that students try to learn anatomy by memorising it (Eizenberg, 1988, Miller et al., 2002, Pandey and Zimitat, 2007, Netterstrøm and Kayser, 2008). But memorising alone does not guarantee understanding, and knowledge retention may be transient. Anecdotally, I consider that podiatry students learn anatomy reasonably well in year one, evidenced by module results, ease of conducting and communicating patient vascular and neurological assessment, and their ability to manipulate the foot in the clinical situation. However, I believe that their musculoskeletal anatomy knowledge deteriorates during year two. By the start of year three my clinical tutor colleagues tell me that students' confidence in anatomy recall and understanding is very low. However, they then get exposure to our complex musculoskeletal clinics and anatomy understanding appears to improve. My own assumptions here are borne out by Hall and Durward (2009) who studied the retention of anatomy knowledge by students of radiography. They found that retention had declined from year two to year three of the course. They reported on some early papers, firstly of nurses where a 20% reduction was found (Ziegler 1931), and an unpublished dissertation thesis of physiotherapy students (1981) where a 16% reduction in anatomy knowledge was found from test to retest. These findings are shared by researchers in the field of medicine who, as an answer to students' knowledge worsening from one year to the next, advocate spacing anatomy teaching throughout the undergraduate curriculum (Kerfoot et al., 2007, Siddiqi et al., 2014). As yet the only studies published on the retention of knowledge by podiatry students is the recall of bone names (Castillo-López et al., 2014, Díaz-Mancha et al., 2016). In Castillo-López et al. (2014) year one and year four podiatry students were tested and 97.2% were found to remember the bones names accurately. Díaz-Mancha et al. (2016) replicated this test but compared four different professional student groups in their fourth year, and found that podiatry students' recall was superior to others in nursing and medicine. So perhaps podiatry students experience anatomy learning differently to these other professional groups. Perhaps there is something about their undergraduate education that is fundamentally different to that of nursing, physiotherapy and medicine. I can certainly surmise that they have more exposure to detailed lower limb anatomy education than nurses, and that the theory and

practice of podiatry is more integrated than the more traditional model of pre-clinical and clinical education for physiotherapy and medicine.

The acquisition of knowledge involves mental cognition. Cognitive theory describes the brain as an organ and how it manages information as a *process* (Clancey, 1997). This theory centres on the mind as a place to receive, organise, store and retrieve information. Cognition involves mediating between what is already known by the learner, including previous expectations and possible misconceptions, and the meaning made of the new learning. Moon (1999 p.109) stresses the notion of meaningful learning: “learning may be defined as the process of making a new or revised interpretation of the meaning of an experience, which guides subsequent understanding, appreciation and action.” van Merriënboer (2016) discussed how learning can occur through induction, deduction, or by elaboration. In induction, learning happens through concrete experience whereby people learn by working on real situations and generate understanding. Deductive learning is when people are provided with information and they apply it to the concrete experience. Elaboration occurs when people are exposed to new information and, through memory retrieval, they connect it to their past understandings. This past and present knowledge can sometimes be seemingly unrelated but help people form structures of understanding. van Merriënboer (2016) gives the example of how an understanding of collapsing stars can be related to an ice skater who is performing a spin which gets faster as they draw their arms by their sides. Sternberg (2000) proposed a cognitive model of knowledge. Represented in the model are memory structures: episodic, semantic, procedural; and knowledge acquisition pathways: from personal experience, or from received knowledge. He wanted to show how people store and use memories to learn. Eraut (2004) examined the use of this model in workplace learning and concluded that reflection should also have a place. He drew on the work of Schön (1983) to discuss the use of reflection in learning from complex situations within professional contexts. It may be that these theories of Moon, van Merriënboer, Sternberg and Eraut might be relevant to the phenomenon of how students learn anatomy and how they use it in clinical practice, but only if they presented themselves through the descriptions in the data. The theories imply that students need several elements for effective learning: to be formally taught, to engage in a variety of experiences, and also to reflect. Only then would students be able to problem solve in applied settings (Sternberg, 2000, van Merriënboer, 2016). To my mind, students need help to reflect, and reflection only comes when they adopt it as a conscious habit. This concept will be developed in chapter two.

1.5 Why is the student perspective needed?

This thesis offers a new perspective on learning anatomy, in an under-researched population of healthcare students. Podiatry students described their experiences of learning and applying anatomy. Their descriptions were used to discover what sense they made of the methods of teaching, how their learning was facilitated, how they made meaning of their learning, and how they translated that learning into clinical practice.

Professional and statutory regulatory bodies do not offer any advice on what or how much anatomy is to be included in the curriculum. Such decisions are therefore left to the individual institutions, largely based on the clinical experience, anatomy knowledge and understanding of their staff.

I assume that students are taught anatomy using a multimodal approach, usually determined by teacher expertise, resource availability, course design and historical memory. The popularity of learning through the use of cadavers has declined in recent years in favour of web-based programmes and mobile Apps. Innovative teaching methods designed to help students acquire and retain knowledge have been researched and published, but the student voice is largely missing from the literature.

Little research exists regarding podiatry students and the learning of anatomy. Presented in this introduction were the discourses predominately being conducted through the education of medical students. Student achievement has largely been measured by module or programme success, and by student perception through questionnaires.

This is the first study of its kind in the podiatric anatomy community and offers fresh insights into the phenomenon of learning and applying anatomy. Three podiatry students¹ were interviewed up to four times each. Janice² had a first degree in psychology and sociology and had worked for twenty one years in social work settings. Richard studied Law and took the bar in his early twenties. When the opportunity presented, he left the legal profession and enrolled onto the podiatry course. Susie had been a renal nurse for the past eighteen years. She had worked as a chiropodist³ before that and considered the podiatry course to be a return to her first career choice. These three students were asked on several occasions throughout

¹ For a biography of each student, please see appendix 1.

² These student names are pseudonyms

³ Chiropodist is an older term, but chiropodist and podiatrist are considered synonymous. Susie's training was run by Scholl, a private high street chain who trained their own chiropodists to work in their shops.

their course to describe their experiences of learning and applying anatomy, in the context of a degree course in podiatry, at an institute of Higher Education.

1.6 The Study

To date, studies on the subject of learning and teaching anatomy have largely centred on medical education. There is little research involving other healthcare professions, particularly those subjects allied to medicine, and a paucity of research conducted on podiatry students' learning of anatomy.

Podiatry is a professional subject applied in the clinical situation to generate effective assessment, diagnosis and justified decision making activity in relation to the foot and lower limb. To this end, it is my assumption that podiatry students need to acquire a certain breadth and depth of anatomy understanding to inform their clinical practice. But it is not known if the learning outcomes for podiatry students are sufficient, or indeed too extensive, for their eventual professional scope of practice. It is also not known exactly how students learn the anatomy they are taught and what sense they make of it in the formal learning environment, or how students of podiatry use their anatomy understanding effectively in clinical practice.

Through a scientific descriptive phenomenological method, using many of the principles of philosophical phenomenology, this research investigated students' experiences of the phenomenon of learning and applying anatomy. The author listened to students' narratives following their experiences of the classroom, dissection room, and different practice settings. The research investigated what is it like for students to experience learning anatomy, and what there was to discover about how students arrive at an understanding of anatomy in the applied setting.

1.61 The context of the study

This study was conducted within the context of the undergraduate honours degree course in podiatry at the University of Brighton. This is one of thirteen courses in the UK. Each aims to integrate theoretical and clinical education by operating one of two models. Firstly there is the model of placements which are blocks of clinical practice in NHS or private settings, usually starting in the first year and occurring periodically throughout the course. Secondly there is a model whereby podiatry schools have clinical facilities on site and students work alongside qualified clinicians on set days of the week every week, throughout their course, to assess, diagnose and manage patients. In both of these models the integration of classroom learning with clinical practice is early and there is an assumption that this will help students

contextualise and apply their theoretical understanding of anatomy in practice more easily. The University of Brighton BSc (Hons) Podiatry operates the second model of clinical learning, that of the in-house clinics.

1.611 The podiatry profession

Podiatry is concerned with good foot health and the improvement of mobility, enabling independence and enhanced quality of life for everyone. Podiatrists assess, diagnose and manage people with foot and lower limb conditions in health and disease, which can help support wellbeing across a range of health and social care arenas. This includes those with long term medical conditions particularly diabetes and vascular disease, musculoskeletal disorders such as arthritis and neurological pathologies, as well as caring for broader public health issues (Townson, 2014, College of Podiatry, 2017). Podiatry is practiced in NHS and private settings so podiatrists can work as part of a wider healthcare team, as part of a team in a podiatry department, or as a sole practitioner. Although patients who have ongoing health issues and may be in more urgent clinical need may be having their condition(s) managed under multi-agency means, it is not a necessity to seek a General Practitioner referral for podiatry. The implication of this is that patients may be seen as part of ongoing and complex care, for a finite period of time until resolution of their condition and discharge, or by their choice with a private podiatrist as single or multiple contacts for foot health care, advice and pathology prevention.

Podiatry is a regulated profession, thus the fundamental basis of podiatry education and care is informed by the Health and Care Professions Council Standards for Education and Training (Health and Care Professions Council, 2017) and the Standards of Proficiency for Chiropodists/Podiatrists (Health and Care Professions Council, 2013). Programmes of podiatry also comply with the professional body standards, the Quality Assurance Framework for Podiatry Education (2013) and the Core Curriculum for Podiatry (2015) published by The College of Podiatry (College of Podiatry, 2018).

In addition to a science honours degree, graduates are eligible for registration with the Health and Care Professions Council and have annotation to the HCPC register for supply/sale and administration of a specified list of Prescription Only Medicines.

Podiatry education is therefore concerned with ensuring students are fit for purpose as a podiatrist, fit for practice in all settings, and that they have the skills required to engage in lifelong learning.

1.612 The BSc (Hons) Podiatry course

At the University of Brighton, the education of podiatry has run successfully as a diploma since 1983, an ordinary degree since 1989 and as an honours programme since 1992. It was validated in a modular format in 1997 and is updated through a review process five yearly. The latest review was in 2017.

The course content is contemporary, the team having considered closely the current health agenda of the population (Lansley, 2010, Department of Health, 2014), and the evolving needs of the healthcare professional to meet these associated demands. The course is a mix of theory, practical, and clinically applied podiatric practice. The educational philosophy of the teaching team is to integrate theory with practice through the use of practical cases and clinical examples. The teaching and learning strategies are often innovative and engage with a wide range of partners in a collaborative learning experience.

There are two main buildings associated with the course; one shared with other professions in the School of Health Sciences, and a dedicated podiatry facility some six miles distant. This has a fully functioning clinical facility where NHS patients are referred for care conducted by the students and each cohort works in the clinic for up to two days per week during the semesters. To supplement this experience, a range of quality external placements in associated settings take place in wider and diverse areas of podiatric clinical practice, with colleagues in other healthcare professions, and with medics in specialist areas of healthcare relevant to the care of the foot.

1.613 Anatomy in the curriculum

Basic anatomy of the musculoskeletal, neurological and circulatory systems is taught primarily in the first year, with functional anatomy and pathology taught in both year two and three.

Brighton is one of the few podiatry courses in the UK who offer full lower limb dissection at undergraduate level. Therefore musculoskeletal anatomy teaching begins with lectures in the theory of the compartment or region delivered first, followed by the dissection experience to see it in the cadaver. Gluteal and thigh anatomy is taught through prosection, leg and foot by dissection. The Human Tissue Authority licensed anatomy room (Human Tissue Authority, 2014) is a dedicated resource for the sole purpose of dissection. It is a controlled access room which has three trolleys on which rest the cadavers, both upper and lower limb specimens. The students are taught in this room under constant and strict supervision, in groups of around six, for up to ninety minutes a session, for six sessions over

the semester. This totals up to 9 hours of exposure to prosection/dissection. Their hands-on participation rotates around the students but is in large part dependent on their willingness to dissect. Learning in the anatomy room is also supported through the use of plastinated feet, plastic models, and real bones.

The plantar surface of the foot is recreated through modelling with plasticine. Quizzes and interactive tests take place several times over the module duration. Camtasia are made available to supplement classroom teaching. Hands-on practical sessions in the musculoskeletal assessment of the foot also take place periodically and make up an element of assessment at the end. Books are discussed at length in the first week of the course, with students encouraged to try out different texts to see which suits their learning preference before they purchase anything. The use of Apps are also discussed and students are encouraged to share the Apps they find useful. Formative tasks are set throughout the module to encourage learning through self-directed study. At the time of the study, the summative assessment was the musculoskeletal Objective Structured Clinical Examination (OSCE) (Harden and Gleeson, 1979) at 40% weighting, and a one hour unseen examination paper of five questions requiring short answers at 60% weighting.

Podiatry at Brighton takes an integrated approach to clinical practice. Clinical experience occurs in tandem with musculoskeletal anatomy teaching through a first semester pre-clinical module. Students watch a few demonstrations of podiatric patient care by clinicians, and are provided with time to practice simple assessment techniques on each other. In semester two, students work in full patient clinics enabling them to work and learn in the clinical environment one or two days per week, every week of the course. Podiatry students can rehearse their new anatomy knowledge, and also apply their learning of the principles of human movement, taught in the second semester, to real patients.

Circulation and neurology are taught with a systemic anatomy approach through key note lectures and theoretical case studies in the classroom in semester two. By the time this classroom teaching occurs, the students have already been engaged in dissection and have seen the vessels and nerves in the cadaver. They should therefore be able to draw on these experiences to recall what they have seen and apply that knowledge to the cases.

Learning anatomy continues into year two where functional anatomy and lower limb pathologies are discussed at length. By year three, students are learning about systemic conditions for instance diabetes, rheumatoid arthritis, connective tissue disease, gout, ischaemia, neurological disease and other conditions that affect the lower limb and foot. As

before, clinical podiatry runs in tandem and students spend time in general, wound care, and surgical clinics. They also have up to eight sessions across year three in the specialist musculoskeletal clinics.

1.614 The podiatry student

Students on the BSc (Hons) Podiatry at Brighton are a mixed group of people in terms of age, prior educational, and vocational, background. For the final year in which this study was concluded, year one statistics on entry were representative of the course overall, and thus representative of the year group employed in this research. There were thirty students enrolled, approximately 15% of course starters being straight from year 13 tertiary education. Mature students made up 85%, maturity defined by university metrics as anyone over 21. In the context of the podiatry course, mature students were generally over 30 years of age meaning that the entry qualifications varied widely with around 20% from a suitable access course such as health professions or science, and 30% with a first degree. A further 35% had qualifications that are not classed as traditional. Prior careers were also diverse and included professionals from media, business and management, craftspeople and health.

1.615 The students in this study

Initially, five students volunteered to take part in this study, but over the course of the programme two of them withdrew. The three who completed were all Caucasian, mature students. They had all been educated to at least degree level, albeit through different means, and had worked as professionals in the law, social care, or health, prior to the start of their podiatry course. For a short biography of each student, please see appendix 1. I had taught them anatomy in their first year, conducted all of the dissection sessions, and marked their written examination papers. In year two, I supervised them in the University podiatry clinics on several occasions, offering feedback on their consultations. I was not a tutor in their third year general or musculoskeletal clinics. These students were all engaged learners who were social and had good relationships with their tutors in the professional environment. I consequently knew these three students well, and they knew me. I was therefore an insider researcher (Finlay, 2002, Hellowell, 2006, Berger, 2015) whereby I am familiar with the context, subject and participants of the study. For a discussion about my insiderness, please see section 3.611. This should not, however, have impacted on this work as I practiced the philosophical phenomenological reduction (section 3.33, 3.41 & 3.62), discussed the findings (section 5.0), and I have reflected on these in sections 5.3 & 9.4.

1.62 Aim and purpose of the study

The aim of this study was to elucidate the essential meaning of the phenomenon of learning and applying anatomy as a lived experience, and to describe the phenomenon using a structure that captured the constituent parts of learning and using anatomy in an applied clinical setting.

The purpose was to illuminate the student experiences of the ways in which they make sense of anatomy learning and how they use anatomy in clinical practice. By generating this scientific knowledge, this study can expand on current thinking of learning anatomy, reveal an understanding of the experience of how students learn and apply anatomy in clinical practice, and offer an insight into this phenomenon through an educational perspective.

It is anticipated that this will add to and enhance the body of knowledge currently available. This enhancement will help teachers of anatomy for podiatry to facilitate learning, and may be transferrable to other healthcare professions in which anatomy is a component.

1.7 Structure of the thesis

Chapter one has been an exploration of anatomy learning and teaching in the healthcare arena. It has sought to draw out the key issues for students and teachers, discuss them in the context in which they have been researched, and apply them to the education and professional practice of podiatry. It raises important questions about anatomy teaching and students' learning. While the healthcare student experience of learning in general is considered in the literature, the chapter suggests that consideration of students' specific experiences of learning and applying anatomy are largely missing from the literature. The context in which this thesis is situated is then presented.

Chapter two is a consideration of the literature relating to the healthcare student experience of learning in general, together with a consideration of the limited amount of literature relating specifically to learning and applying anatomy. It discusses current thinking about how skills of application are developed and how students translate their classroom learning into applied clinical practice. The chapter then turns to relevant phenomenological, phenomenographical and other qualitative research conducted into the student experience of other healthcare education.

The methodology is presented in chapter three. Principles of philosophical phenomenology as attributed to Edmund Husserl (1859-1938) are explained through the lifeworld, natural attitude, phenomenological reduction and intentionality. The practise of the scientific

descriptive phenomenological method as proposed by Amedeo Giorgi (2009) is justified as the methodology of choice, and supported by an extensive discussion about rigour and reflexivity in phenomenological research. Data collection methods and processes are then detailed.

Chapter four describes the findings of the study. The process of data analysis is detailed, followed by a presentation of the resultant structure of the phenomenon of learning and applying anatomy as lived by the three podiatry student participants. Each of eight constituent parts is presented separately, demonstrating how the students expressed their lived experience of learning and applying anatomy.

Chapter five discusses the findings firstly as an inductive discussion of the phenomenon of learning and applying anatomy, and then as a deductive discussion in light of literature. A critical evaluation of the rigor and conduct of the methodology is then offered.

A model for learning and applying anatomy is suggested in chapter six. This emanated from the discussion and is the original contribution of this work to knowledge.

Chapter seven draws conclusions from this study, and gives suggestions for future work. In chapter eight I offer a number of recommendations to teachers of anatomy for podiatry to help them facilitate students' learning. These may be transferrable to other healthcare professions in which anatomy is a component.

Chapter nine consists of my reflections and reflexions about the doctoral journey, teaching anatomy, phenomenology as a research methodology and method, and my influence on the research.

2.0 LITERATURE REVIEW

The introduction raised how the educators of anatomy have been exploring a variety of ways to help students learn anatomy more effectively (Estai and Bunt, 2016, Ghosh, 2017). In this chapter, I will present a conceptual literature review that focuses on learning and applying anatomy from a student perspective. I have made explicit my interest in the subject, and my motives for exploring it. I have also stayed aligned with the methodology of phenomenology, and written the conceptual literature review before the analysis of the data.

To start, I have defined and discussed the phenomenon in question. The students I chose to study were learning within the context of education, and there is a requirement that they apply that knowledge and understanding to the enhancement of the health of podiatric patients. To help me conceptualise the phenomenon, I therefore sought literature from both educational and healthcare bodies of knowledge. I selected papers that helped me identify and discuss my own understandings of the phenomenon in question. They revealed my interests at the start, and helped me recognise what I had to set aside when I adopted the phenomenological attitude and the reduction. More on this will be discussed in chapter 3.0.

The review then focuses on three areas of interest. Firstly, I have identified and explored the student experience of learning anatomy, their motivations to learn the subject, and the concept of reflective practice. To this end, I selected literature which explored students' perceptions of innovative and/or interactive teaching methods, their motivations to learn and their behaviours when learning. I have also included some literature on reflection and its place in learning, and offer a short appraisal of the writing of some scholars regarded as influential for our understanding of reflection and encouraging its practise in both the mediated learning and application contexts.

Secondly, the review considers current thinking around how anatomy and other clinical skills of application are developed, and how students translate their classroom learning into applied clinical practice. The emphasis has been on podiatry and its place in the effective clinical care of patients with lower limb disorders. Where possible, parallels have been drawn between podiatric and medical education of anatomy. I have presented the discourses about how much anatomy knowledge podiatric students may consider is enough, the influence of clinical environments in learning how to apply anatomy, the ways in which students experience their professional development from being a novice to becoming a competent clinician, and how teachers of anatomy have encouraged and facilitated anatomy application through the provision of authentic experiences.

Thirdly, the chapter critically engages in a discussion of studies which have used the methodologies of phenomenology and phenomenography to understand the lived experience of students and graduates as they engaged with their professional courses and associated clinical practice. The studies were in subjects related to learning and applying anatomy in the context of healthcare education, such as learning pathology, and applying nursing knowledge in the clinical environment. This has situated the phenomenon of my study, learning and applying anatomy, in the literature and identified gaps in the knowledge, thus providing the justification for my study.

The chapter concludes with the identification of the phenomenological question, and the aims and objectives of the study.

2.01 The Phenomenon of the study

I have been the teacher of anatomy in the podiatry department for nearly twenty five years and am passionate about the student's learning of it. Through this personal experience and before embarking on this enquiry, I considered that students learned morbid anatomy reasonably effectively at the point of delivery, but that they found the details hard to retain and had difficulty using them in the clinical context. As a professional teacher, I wanted to understand the ways in which students make sense of anatomy learning, and apply their understanding to its practice in clinic. The context is healthcare education.

It is my opinion that anatomy is a static subject if taught and learnt devoid of any sort of explanation and experimentation of purpose. For me, application is a necessity from the start of a student's academic course. Students can be encouraged to apply anatomy learning in the classroom through the use of authentic situations in teaching. Examples of application when in the classroom would be learning with and through fellow students as models, observations of the general population and how they display similarities and differences in walking, and through case study designed learning materials. Equally, students may apply in practice what they have learned in the classroom, but their learning can be enhanced by being taught anatomy theory in the clinical setting opportunistically, and through frequent patient interaction. I therefore believe that learning and applying anatomy are inextricably linked. Consequently, the phenomenon in question was not two phenomena, one of learning anatomy and the other of applying anatomy in practice, but one phenomenon of learning and applying anatomy.

The purpose of the literature review for this phenomenological study is to contextualise the phenomenon of learning and applying anatomy. Exploring and explaining relevant literature

helped identify the practices, perceptions and beliefs about the phenomenon, and enabled me to select the appropriate literature for review. The aim was to blend areas of conceptual knowledge to understand more fully the phenomenon being studied. This literature review has therefore not been a systematic review, whereby a critical method of assessing theories and hypotheses is adopted, as this would not serve to locate the context of the phenomenon. Instead, it is an exploration of learning anatomy, understanding how it is applied in practice, and the lived experience of students and graduates who have experienced their own journey to understanding. The search strategy has therefore been selective so as to illuminate my conceptual understanding of, and personal positioning in relation to, the phenomenon of learning and applying anatomy. This aligns with the phenomenological methodology of contextualising the phenomenon.

2.1 The student experience of learning anatomy for podiatric practice

Little has been written about podiatry students and their learning, and particularly little about their learning of anatomy. Indeed I found only four published papers. Weir and Carline (1997) studied students' reactions to learning with cadavers, Castillo-López et al. (2014) and Díaz-Mancha et al. (2016) who were both from the same institution tested student recall of bone names, and Smith et al. (2017) compared podiatry and medical students' approaches to learning anatomy. I can only surmise that the paucity of theoretical papers for podiatry is reflective of the lack of conceptualisation of anatomy for practice by podiatry educators, and provides justification for this study.

The literature of other allied health professionals offers some interesting insights into the impact of anatomy learning, which may be applied to students of podiatry. Cooper and McConnell (2000) looked into the use of a web based tool to assist physiotherapy students to practice their human movement analysis skills. Choudhury et al. (2010) introduced classroom based interactive activities and web based self-testing tools for optometry students to assist with learning anatomy. Hall and Durward (2009) focussed on the retention of anatomy knowledge by students of radiography from year one to year two and then year three. While these studies are interesting, the issue for me is that they all used a questionnaire to canvass student opinions. I find two main difficulties with this method. Firstly, responses are elicited only to those questions specifically posed, narrowing the focus and possibly missing the issues which are important to the respondent. Secondly, responses are all in terms of a Likert scale from agree to disagree, limiting the choice of a respondent and forcing them to choose an answer which perhaps does not adequately reflect their experience of the issue. From these studies it is clear that the anatomy curricula for allied health professionals

is being challenged. Researchers are looking for new ways to engage learners and enhance the outcomes of effective anatomy knowledge. However, the development of an understanding of how students experience these new teaching and learning methods, how they come to achieve module success, and how they develop anatomy use in practice is still to be investigated.

One study into students' experiences was that of Clough and Lehr (1996). For the assessment of their module, three consecutive cohorts of first year medical students were required to perform two 30 minute 'expositions' on multiple aspects of anatomy content, in the dissection room. The researchers compared these cohorts' module results with those cohorts assessed using the traditional written and practical examination and found that the students learned anatomy equally well. However, the study students themselves reported more positively about their experience of the oral examination because it was performed in the actual environment in which they learned the anatomy. They described having an enhanced retention of knowledge, being more confident and enthusiastic about anatomy and its importance in medicine, and feeling better prepared for the later application of anatomy to clinical situations. However, it could be argued that these findings were not developed through robust research, having been derived through 'roundtable discussions', suggesting that this was an informal evaluation of the module assessment method. The authors also acknowledged that they had yet to explore how this may impact on students' clinical practice. Caution needs to be exercised over how generalizable these results are, but the paper paves the way for further and more insightful research into the student experience.

Weir (2008) conducted focus groups of speech pathology students, and Martin et al. (2014) interviewed individual clinicians of Speech and Language Therapy, about their perceptions of undergraduate anatomy teaching and its apparent relevance to their clinical practice. Both studies found similar results; that motivation to learn can be influenced by the teaching strategies the participants experienced, and that therapists recognised the importance of anatomy but were selective with the anatomy they learnt and used in practice. Their outcomes highlighted the importance of student confidence when learning anatomy effectively, and to seeing relevance in the knowledge as applied to clinical practice. What these studies did not address is what it was like for the students and clinicians to be taught as they were, and in what ways the students and clinicians applied that learning to their clinical practice. There is a need for research that explores the lived experience of students to understand, from their perspective, what it is like to learn anatomy, and as importantly, how they then perceive the use of that learning in the clinical situation to enable them to

become competent practitioners. Weir (2008) and Martin et al. (2014) studied students of speech pathology and speech and language therapy, and there is certainly value in their work for other professions. By studying the lived experience of students of podiatry through a descriptive phenomenological method, other health professions may find the outcomes useful in gaining insight into their own students' experiences of anatomy teaching and learning.

2.11 Motivation to learn anatomy

Various motivations for learning have been researched from different theoretical perspectives (Marton and Säljö, 1976, Greasley and Ashworth, 2007, Smith and Mathias, 2010, Ward, 2011, Böckers et al., 2014, Abdel Meguid and Khalil, 2017). However, I would suggest that there are gaps in our understanding with regards to how motivation is actually perceived and expressed by students. I would propose that the complexity and range of motivations warrants further phenomenological investigation.

In my experience, some students appear only to want to know what will be in the final exam, or become fixated on the lack of consensus over the intricate detail of an insertion point of a particular muscle in various text books. Conversely, others seem to want to grasp the most complex concepts and want their whole anatomy education to be dissecting a human limb. These experiences of teaching anatomy suggest some of the complexity of motivations exhibited by my students. I have therefore been interested in exploring what motivates my students to learn, to help me understand their needs as learners (Wormald et al., 2009, Martin et al., 2014).

Marton and Säljö (1976) classified this motivational approach to learning as either deep or superficial. A deep approach to learning anatomy is where the student is genuinely interested in the subject, takes into account the context and value of the material to be learnt, explores it for meaning and reason, and applies it to the entirety of that subject. In the surface approach, the student can be fixated on detail, taking a narrower focus by collecting pieces of information and remembering facts without considering how they fit with the whole. The Approaches and Study Skills Inventory for Students (Entwistle, 1997) is based on the work of Marton and Säljö, and is a tool that can be used to gauge motivation in learning. Studies using this inventory have sought to categorise students' approach to learning anatomy through their responses to a series of statements (Ward and Walker, 2008, Smith and Mathias, 2010, Ward, 2011, Smith et al., 2014, Smith et al., 2017). This research has consistently demonstrated that there are a range of types of learners in every classroom and

claims that learners move from surface to deep learning and back again depending on what they are being taught and the outcomes they are trying to achieve. Smith and Mathias (2010) reported that when students experienced the subject as a vast amount to learn and tried to memorize facts, they were taking a surface approach to learning anatomy. The students in the study who took a deep approach were confident with anatomical language, and experienced the subject through an engagement with human dissection and medical imaging. The value of dissection in fostering a deep approach to learning was also explored by Abdul Meguid and Khalil (2017) who studied how working with cadavers can be a motivational tool. Through their use of the Attention, Relevance, Confidence, and Satisfaction (ARCS) model of motivational design (Keller 2010, in Abdel Meguid and Khalil, 2017), they found that there was a significant positive correlation found between the students' motivation for dissection and the level of knowledge exhibited. These studies have given us insight into the ways in which students are motivated to learn anatomy. However they are orientated towards the mental processes of learning such as thinking, imagining and noticing. The lived experience of the subject of anatomy itself was not considered, and is under-researched.

To address how students might learn subject specific material, Greasley and Ashworth (2007) studied students' approaches to learning in general. They gathered students' lived experiences of learning, and analysed their data using a descriptive phenomenological approach. In the analysis of the results, they emphasized the noesis-noema distinction (Husserl, in Ehrlich, 1996). Noesis is the 'how' of learning, through orientation and cognition by perceiving, thinking and imagining the thing to be learned. The noema is the object to be learned, the 'what' of learning, and the content of the situation. Through this noesis-noema distinction, Greasley and Ashworth found a much more complex array of ways in which students engaged with the subject. Essentially, Marton and Säljö's (1976) phenomenographical work was positioned in the noesis, whilst Greasley and Ashworth's work discovered how the noesis interacted with the noema. The findings of Greasley and Ashworth (2007) therefore offered a more comprehensive insight into the motivations behind student learning. Although this conceptual literature review was not exhaustive, I found no studies in which the noema of anatomy had been studied using Greasley and Ashworth's approach to understanding students' motivation of learning (Greasley and Ashworth, 2007). This would seem to be a further gap in the current medical education literature.

The time and effort students invest in their learning is very important. The effects of classroom, dissection room and the clinical contexts on learning involve not only a cognitive

and environmental dimension, but an equally important motivational input. Koens et al. (2005) put forward a model in which these three dimensions were represented on a continuum, from a reduced situation (a simple task with little meaning) to an enriched perspective (a complex, real life task). Educators can manipulate classroom learning situations to any point on the cognitive and environmental continua, but the students themselves need to determine the level of commitment, or motivation, they wish to bring to the situation. Educators have opportunities to influence that motivation through the ways in which they engage their students in learning (Estai and Bunt, 2016, Ghosh, 2017). But it would seem that effective ways to do this for the subject of anatomy are as yet unknown. The current study offers a way to understand how students engage with the subject of anatomy, and how they use it for effective application in clinical practice. Through these insights, it is anticipated that meaningful change can be brought about for students by anatomy educators and clinicians.

2.12 Reflection as an element in learning

In the introduction I suggested that reflection is a key element in learning (Eraut, 1994, Moon, 1999). In my opinion, learners need to develop a capacity for reflective judgement (Marshall, 2008) and a reflective attitude (Dewey, 1933) if they are to develop and apply knowledge (Habermas, 1971). This necessitates becoming more aware of themselves, how they learn and how this affects their actions, emotions and thought processes (Xie and Sharma, 2005). Dewey (1933) considered reflective thinking in terms of making sense of the world, and I believe that students who adopt a reflective attitude to learning have the potential to apply that attitude to clinical work and become successful reflective practitioners. I encourage my students to reflect on their learning of anatomy, and their learning in general, to help empower them to practice safe and effective podiatry. However, I also hold the view that reflection is a tool which can be used to generate and develop knowledge (Habermas, 1971). Students need encouragement and assistance to become aware of their learning and become more reflective (Chan, 2015), this awareness needing to be engendered before they can engage in rethinking their life and anatomy learning experiences (Hatton and Smith, 1995). They should be challenged to use thinking in a structured, meaningful way to explore their own personal values and beliefs (Rees, 2013). Habermas deemed that each learning opportunity should lend value to the student's experiences, and that they must recognise that being reflective can enhance their ability to learn. Moon (1999) suggested that the teaching and learning strategies employed should ensure learning is meaningful by enabling students to make connections between past and

present knowing, and increase the coherence of the subject. Only then can students access that meaning and make sense of it.

A substantive definition of reflection is problematic. Put simply, I would claim that it is to think very deeply about past experience or knowledge and use it to inform and process learning. Dewey (1933) suggested that reflection was much more purposeful, that it was 'intentional', or 'deliberate', and that the reason for its pursuance is to come to a useful outcome. This can be conscious or not, and intuitive or not. A further way to understand reflection is not just to 'think' or 'recall', but it is the deconstruction of a complex situation or idea with no obvious solution, and is closely associated with learning and the involvement in learning (Moon, 1999).

The literature regarding reflection is nebulous and ambiguous (Hatton and Smith, 1995, Moon, 1999). Without due regard to the problem of definition, reflective practice is considered an absolute necessity by healthcare providers (Health Education England, 2018), regulators (Health and Care Professions Council, 2013) and educators (Ghaye and Lillyman, 2012). The claims are that engaging in reflective practice can positively influence outcomes, promote effective care, enhance continued professional development and encourage practitioner autonomy (James and Clarke, 1994). The evidence for these claims is weak, although research published in the past 20 years has strengthened the premise. Much of what is assumed with regard to reflective practice in nursing and other subjects allied to health has been based on work by Schön. Donald Schön wrote about reflection through his view that universities 'are committed, for the most part, to a particular epistemology, a view of knowledge that fosters selective inattention to practical competence and profession artistry' (Schön, 1983 p.vii). Schön was the first to embed reflection in a practice setting, describing learning-on-action where practitioners are thinking about what they have done after the event, and learning-in-action, the learning taking place simultaneously with the activity itself. His work generated considerable interest over the following decades, particularly by educators (Moon, 1999).

I found little specific research concerning the actual mental activity of being reflective, but there is considerable general research on the use of reflection to explain aspects of practice. Reflection is often contextualised through, for instance, discussion about clinical reflection, reflective practice and critical reflection. Reflection as a mental activity is therefore only demonstrated through the practice of working clinically, or being critical. Ghaye and Lillyman (2012) stated that nurses possess and should develop the skills and qualities to be reflective, implying that being reflective is a natural characteristic in human beings.

However, reflection is a complex and multifaceted thought process, and Dewey (1933) acknowledged that thought can have different facets. For instance, it can be automatic and unregulated, and it can provoke the imagination into perceiving unreal things. Thought may also be a belief in a principle for which we have no secure knowledge but accept or reject as true. The attitudes commensurate with reflective thinking are the ability to engage ‘whole heartedly’, and to develop a ‘habit of thinking’ in a reflective way (Dewey, 1933 p.33). However, the thinker also needs to take a critical stance on the evidence that supports their beliefs, and to be intellectually responsible for new ideas and accept their consequence. Hatton and Smith (1995) argued that the concept of critical reflection was fast becoming ideology, and that it was in danger of being accepted and unchallenged. As we are all capable of reflection, there is the potential for its effective teaching and facilitation for everyone, and attention should be paid to how a reflective, and critically reflective approach to learning can be fostered, developed and practiced.

The philosopher Habermas (1971) considered reflection to be a tool used to develop knowledge. Whilst Dewey was an interpretivist looking at reflective thinking in terms of ‘making sense of the world’, Habermas was more concerned with the nature of the knowledge and how we generate that knowledge. He considered that knowledge derived from critical thought pushes the ideals of empowerment and political emancipation so as to ‘understand the self, the human condition and self in the human context’ (Moon, 1999 p.14). He believed that transformation of the self, the social or the world situation could be the result. Barnett (1997) criticised the writings of Habermas suggesting that if critical reflection was only about knowledge then the full aim of higher education would be missed. To achieve a comprehensive summation of critical reflective thinking, Barnett supported the addition of action to pursue knowledge acquisition, and saw the student as a person developing through understanding, self-reflection and action. With the addition of action in reflective practice, there is support for my earlier suggestion that reflection is complex and is something to be developed, enhanced and refined.

In 1977 Van Manen theorised more specifically about reflection in the process of educational curriculum development, considering it to be a tool applied to a task. He took a Habermasian view that the curriculum should promote emancipatory ideals. However, by 1991 Van Manen was taking a much more Dewey stance defining reflection in terms of a mental process in which an event or experience is viewed in an objective way (Van Manen, 1991, Van Manen, 1995). This work resonates with me because it represents a journey from Dewey’s ‘thinking’, through Schön’s reflection on experience, to Habermas and his

reflection on the conditions that shape that experience. The phenomenological approach attributed to Husserl is distancing oneself from the event, looking back with a phenomenological attitude, and turning consciousness in on itself. This is an intentional act of reflection, and is retrospective.

Lachman and Pawlina (2006) wrote of how reflective practice can be incorporated into anatomy education to promote professionalism. They reviewed the theory of reflective practice as applied to the learning of anatomy and its implications for clinical practice. They offered several pedagogic strategies by which anatomy educators can incorporate and encourage critical reflective thinking to the benefit of learning anatomy and its use in professional practice. However, this paper was an exploration and review of reflection in anatomy learning. It was not an evaluation of an intervention, or of the understanding of the ways of knowing how students reflect on anatomy in practice. The impact of reflection on students' anatomy learning, their application in practice and any bearing on patient care has yet to be researched. The descriptive phenomenological approach to research dictates that the researcher analyses their data inductively and without pre-conceptions. This is how I approached my study. Together with this review of the various ways in which reflection may or may not be manifest in learning, my a-priori experience of teaching both anatomy and reflection has helped me understand that reflection may show itself within the data, and therefore I am revealing my interest here before I put it to one side during the reduction (Giorgi, 2009).

2.2 Students' perceptions of applying anatomy for podiatric practice

There is limited time available to devote to anatomy education in podiatry courses, so content needs to be focussed and relevant. It also needs to be meaningful to the students so they can apply it to the patient assessment as soon as they experience clinical education. This provides opportunities for the students to make sense of the learning in practice. The next question is what students' perceptions are of how much anatomy education they consider sufficient for effective practice. Students may offer something of how their ideas of anatomy application are formulated, and how they might develop from the novice to competent clinician. The value of authentic teaching and learning methods in helping students apply their anatomy more readily in the clinical setting also needs to be considered.

2.21 How much anatomy knowledge is enough?

In the introduction, I made the observation that my experience of teaching anatomy has led me to suspect that an issue for students is what depth of anatomy knowledge they need. This is a frequently asked question, particularly in my year one classroom, and it likely stems from their initial naivety of podiatric practice. Podiatrists use anatomy to form the basis of their diagnosis and management of musculoskeletal conditions. This is largely of the foot, frequently the ankle, leg and knee, and then less commonly the thigh, hip, buttocks and lower back. In the 2012 Global Burden of Disease Study (Hoy et al., 2014) into the worldwide affliction from musculoskeletal disease, 1.7 billion people were estimated to be affected by osteo- and rheumatoid arthritis, gout, low back pain and other musculoskeletal disorders. Hip and knee arthritis was ranked as the 11th highest contributor to disability of 291 conditions, demonstrating the size of the problem worldwide (Cross et al., 2014). A report by the College of Podiatry in the UK (Townson, 2014) stated that the care of people with musculoskeletal conditions, particularly rheumatoid arthritis, accounts for around 5% of the NHS budget. These conditions commonly present to the podiatrist for management. Musculoskeletal conditions such as a bunion (a deviation medially of the first big toe joint), painful foot arch or small toe deformity are a common reason for a person to seek podiatric intervention. Rheumatological and some neurological conditions can also contribute to foot deformity. Ankle, knee and hip alignment can dictate foot shape and function, or vice versa, and a podiatrist may be required to prescribe an orthotic. This is an insert in a shoe with added areas of material to redistribute pressure bringing about a change to the function of the foot. In these examples, podiatrists need to have adequate knowledge to understand the structural, kinetic and kinematic factors which may induce pain or compromise function. They can then understand the change to the foot's structure, and consequential alteration of function brought about by the deformity and any potential relational effect to other parts of the limb. They are then able to provide, with a measure of confidence, effective interventions to reduce pain and possibly arrest pathological development (Frowen et al., 2010). Without such detailed knowledge and understanding, the clinician can only surmise and could prescribe an intervention/orthotic which is inadequate, ineffectual, or actually causes harm by altering function to the detriment of the patient, all of which are unethical.

But podiatry is not only about the management of musculoskeletal disorders of the foot and lower limb. The podiatrist also manages patients with systemic pathologies such as acute or chronic arterial and venous disease, long term respiratory conditions, and renal impairment, which can all affect the health of the foot. The most prevalent patient group seen in the general podiatric clinic is the person with diabetes (College of Podiatry, 2017), diabetes

being a result of pathology of the endocrine system. People with diabetes can have multiple foot problems: a lack of sensation, blood flow irregularities, repeated skin infections and toe nail pathologies (Boulton et al., 1999, Clokie et al., 2017). The podiatrist's role in this regard is to treat resolvable ailments, prevent foot ill-health, detect life-threatening pathologies and reduce the risk of limb amputation (Diabetes UK, 2010, Bacon and Borthwick, 2013). My belief is that podiatrists should have a working anatomy knowledge of the circulatory, respiratory, renal, endocrine, neurological, and integumentary systems in order to address the podiatric health needs of their patient populations. I have reflected on my own personal experience of podiatric practice and I recognise the necessity of knowing and understanding anatomy which enables me to determine the baseline level of foot health to; recognise indicators of foot health improvement, maintenance or deterioration due to pathology; undertake effective treatment; and justify appropriate referral to other agencies (Frowen et al., 2010). I am interested in how students might view the extent of anatomy learnt, its importance for practice, and its use in practice. I believe it is important to understand the complexities of student voice more, if we are to understand their experience and beliefs about how much anatomy is enough. Through a descriptive phenomenological methodology, I want to discover if the phenomenon of learning and applying anatomy helps me understand students' experiences more thoroughly.

2.22 The influence of clinical environments on learning anatomy

It has been argued that most learning occurs in practice (Eraut, 1994, Bonello, 2001, Eraut, 2004, Field, 2004, Eraut, 2009). Outcomes of much medical research have concluded that the context in which the student is learning and the application of that learning in clinical practice can have a very positive effect on the learning of anatomy (Smith and Mathias, 2011, Lazarus et al., 2012). McCrorie (2000) and Martin et al. (2014) suggested that the teaching of anatomy in the clinical setting increased the relevance of the subject and enhanced understanding of clinical problems. It might logically follow that anatomy for podiatrists should always be taught and experienced in clinic. However, it is not this straightforward. While this environment is an enriched setting and the student commitment may be high (Koens et al., 2005), activity in a busy clinic is often unpredictable and cannot be tailored to the specific learning desired. The risk is that the cognitive dimension of learning cannot be controlled, and the student may experience disconnect between any anatomy learning task set and the meaning of that task in reality. The consequence could be that the learning needs of the student may not have been met and their motivation could wane. No literature has been found that has investigated the mismatch between student

expectation of learning anatomy, the motivations they bring to a learning experience, and their ability to apply their knowledge in unpredictable clinical situations. Asking students to describe particular instances of their application of anatomy to practice may illuminate these inconsistencies and assist teachers when preparing students more appropriately for their clinical encounters.

2.23 The student experience of developing from the novice to competent clinician

This was a longitudinal study. It was designed to gather insights into the experiences of students as they become competent clinicians. It is therefore appropriate to understand something of the literature around progressing to competence.

Benner (2001) was of the opinion that clinical experience was the key. She used the Model of Skill Acquisition (Dreyfus and Dreyfus, 1980) as applied to nursing to discuss how nurses transition from being the early learning novice to the skilled, intuitive expert. Although it has attracted much criticism, for instance the methodology has been criticised as biased to the positive, and questionable in regards to the interpretive methods employed (Allen and Cloyes, 2005, Altmann, 2007), it could be a useful way to consider expertise. Based on Heideggerian phenomenology, Benner interpreted the descriptions of nurses' lived experiences of nursing practice to identify meanings and content, and categorised the descriptions into those that characterised a novice, advanced beginner, competent, proficient or expert clinician. For Benner, novices enter the clinical environment with facts and concepts they have learnt in the classroom and usually with little ability to apply them. This has also been documented with regard to medical students (Smith et al., 2014), and could equally be true of all healthcare students. These early students gain experience of putting into practice basic knowledge and skills by operating through the simple rules of their own profession given to them by their lecturers. It is unclear as to how the transition is made (English, 1993), but the novice becomes Benner's second category, the advanced beginner. The student now has some clinical know-how, but lacks experience of similar situations, and therefore works in what are described as aspects of care. To apply this to podiatry, the student may have a patient with a deviating first toe. The student may have previously experienced that a joint like this will lack motion, possibly cause pain and may appear a little red. They may have been instructed to test it for its range, direction and quality of motion, which they can do competently. However, they may not have the understanding at this stage to interpret their findings, for instance whether it is of concern that motion is restricted and crepitus can be felt, or that the deviated toe might have an effect on the patient's normal gait pattern and what that effect might be. Benner's competent clinician is reported to have achieved this

level through several years of experience. It manifests through being able to think through and plan priorities of an episode of care. In podiatry this would translate as a senior student or the early graduate, organising their time with a patient to discuss the clinical problem, take a thorough history, perform the necessary clinical assessments, prioritise the management and perform treatment effectively. This competence requires much effort and they would be drawing on knowledge, skills, interpretation of results, problem solving and clinical decision making. They would also need skills in communication and negotiation. The next category of Benner's Model is that of the proficient clinician. Benner describes the proficient clinician as seeing the whole picture, as opposed to disarticulated parts. They do not undergo a deliberate thought process but perceive the case as an entity in itself. This proficient clinician operates in terms of long term planning, not short term goals of care, and employs their analytical skills when the situation warrants it. Finally, and still with no clarity as to how the transition is achieved (English, 1993), practitioners become expert clinicians who are intuitive and undertake clinical decision making from a deep understanding of the whole situation. They appear to be working from empirical perception. Cash (1995) refutes that this 'intuition' is a valid measurement of expertise, however it has also been expressed as a measure of a doctor's expertise by Eraut (1994) and Kahneman (2003). Purkins (1994) challenges Benner's model as questionable because of its disregard of social structure, and I am equally cautious as I consider the model to be over-reliant on individual experience, taking into account little of what we know to occur socially in learning environments. There would appear to be a gap in our understanding of how students understand their own experiences of constructs such as intuition, novice and expert, and whether these constructs are actually a part of their experience at all. Although there is a strong criticism of Benner's model, it does not invalidate it, but emphasizes that caution should be applied appropriately and with due consideration to the context of the work.

2.24 Authentic learning of anatomy for podiatric students

Bergman et al. (2008) reviewed students' knowledge of anatomy in eight Dutch medical schools, and concluded that teaching anatomy in a clinically meaningful context might enable more efficient and lasting learning that would make more sense to a student. A recommendation was to situate the learning of anatomy in an authentic learning environment.

Authentic learning is the exposure of students to real resources, short of full clinical practice, early in their professional education (Lombardi, 2007, Pawlina and Drake, 2016). It is popular in the medical profession because its aim is to help pre-clinical students understand

the relevance of their classroom learning to patient based situations to which they are not exposed for several years (Bergman et al., 2008, Yardley et al., 2013). My assumption is that it may be less necessary for the student of podiatry who has real clinical experience from early in the programme, however it is still worth exploring. Anatomy teachers who employ dissection as a teaching strategy consider it to be the student's first contact with authentic learning (Yardley et al., 2013, Pawlina and Drake, 2016). It introduces them to a real body and elicits genuine emotions. They can see normal anatomy and discuss how pathology might alter the structures. To dissect a cadaver, students use scalpels, forceps and other instruments used in podiatric practice and therefore they learn some useful manual technical skills. They also consider human mortality, attitudes and values of life, and ethics in the professional context. These are all relevant to the clinical situation. It is argued that this early authentic contact encourages students to engage in real life problem solving, is more meaningful to individuals, and that they can therefore make sense of anatomy more readily (Pawlina and Drake, 2016). They may then understand how to use that knowledge in the clinical setting more meaningfully. But the unproblematic transfer of such experiences to clinical practice cannot be assumed.

Clinically-orientated anatomy is advocated as a more effective method of learning to apply anatomy knowledge and understanding (Clough and Lehr, 1996, Bergman et al., 2008, Gregory et al., 2009). Experiences of the dissection room, medical imaging, and the practise of physical examination skills on peers and simulated patients may help students find relevance of anatomy knowledge and understanding (Gregory et al., 2009). But early year students do not have any clinical experience on which to situate such learning, their understandings being based on theory and hypothetical cases. Learning anatomy can also be triggered through the use of clinically based case studies (Lombardi, 2007, Thistlethwaite, 2015). These experiences may offer students opportunities to use their powers of reasoning and enquiry-based analysis to conceptualize the whole picture, decipher what they need to know, and acquire understanding in the process (Miller et al., 2002, Takkunen et al., 2011). But do these strategies actually develop knowledge and enhance understanding, and what is the student's experience of them? Miller (2002) and Takkunen et al. (2011) concluded that the use of real patients can indeed enhance the students' incentive to learn, as real cases can be more interesting, increase student motivation and improve levels of confidence. However, these papers do not report if outcomes in terms of anatomical understanding were improved.

It has been argued that a more meaningful way to learn anatomy is through earlier clinical exposure (Pawlina and Drake, 2016). Anatomy is traditionally taught in the initial stages of

medical education, before students have grasped basic concepts and before they can apply much of it to practice (Smith et al., 2014). Lazarus et al. (2012) questioned medical students in their clinical rotations about their perceived ability to apply anatomy knowledge to clinical practice. In their medical course the theory was taught in year one while the application did not occur until year 4. A not unexpected finding of this study was that the participants found application difficult. Lazarus et al. reported that a substantial factor appeared to be that there was disjuncture between the classroom learning of anatomy and its use in the applied situation. They surmised that this was due to both a temporal and spatial disparity between the acquisition of knowledge and the environments in which anatomy was taught, and the clinics in which the participants were required to apply the learning. I have suggested that the amount of time devoted to anatomy education in podiatry courses means that content needs to be focussed, relevant and meaningful, so that students can apply their new knowledge to patient care as soon as they experience clinical education. This provides the opportunities for the students to make sense of the learning in practice. Nevertheless, there is as yet little evidence to substantiate the claims that exposure to authentic teaching and learning methods in any way helps students to apply their anatomy more readily in the real clinical setting. The student voice is missing from the anatomy literature, and is another justification for my study.

2.3 The Lived Experience of learning anatomy

The purpose of the conceptual literature review for this phenomenological study is to contextualise and situate the phenomenon of learning and applying anatomy in the literature, and identify gaps in the knowledge which provide the justification for my study. In this final section, my intention is twofold. Firstly, to discuss literature which used phenomenology or phenomenography as a methodology or method and that I considered relevant to the context for my students, and that located learning and applying anatomy with other studies. Secondly, to illustrate further why I feel it is potentially productive to conceptualize the phenomenon of learning and applying anatomy in my professional context as a single entity, and not to divide them into learning, and applying. I use the literature in this section to demonstrate that previous phenomenological studies have found the concepts of noema and noesis inseparable when focusing on students' lived experience of learning anatomy (as previously defined in section 2.11).

2.31 Phenomenological studies

It is possible that the experience of podiatry students learning in the clinical setting is influenced by the clinician supervising their patient interactions. Nursing literature discusses the value of the relationship between tutor and student, and how it can enhance, or indeed diminish student learning (Windsor, 1987, Öhrling and Hallberg, 2000a, Öhrling and Hallberg, 2000b, Öhrling and Hallberg, 2001, Gillespie, 2002, Papp et al., 2003, Chesser-Smyth, 2005, Weidman, 2013). Hermeneutic phenomenology was the methodology used by Öhrling and Hallberg who published two papers on the phenomenon of preceptorship (Öhrling and Hallberg, 2000a, Öhrling and Hallberg, 2000b). These papers explored the lived experience of the students' and tutors' relationship in enabling effective learning in a clinical setting. The studies reported a mutually rich relationship. Tutors created space for students to learn and directed the learning towards competence and responsibility. They also facilitated the development of nursing skills by allowing students to move between skills demonstration and hands on practise. As a consequence, students experienced a sense of security and gained confidence. The students suggested that it had developed their clinical practice, although the studies did not suggest to what extent. Öhrling and Hallberg (2001) and Weidman (2013) examined the lived experience of becoming a nurse educator. Both revealed that qualified nurses find responsibility and value in supporting students in their learning, and seek to protect those students from their vulnerabilities and shortcomings. However, in doing so, teaching uncovered the practitioners' own vulnerabilities and shortcomings, largely due to their innocence of education theory and skills. These four papers give insight and language to what it is like to be a learner and a teacher, and how that interaction can play out in a clinical setting. They also lend weight to my argument that learning and applying can be inseparable entities. However, there is clearly more to the student-clinician relationship than is given in these papers.

Chesser-Smyth (2005) and Papp et al. (2003) conducted interviews with first year, and second, third and fourth year student nurses respectively, asking them for their lived experiences of their clinical placements. The themes identified were around students' awareness of themselves as learners, their confidence and anxieties, and the ability of their educators to facilitate learning. A powerful theme of the discussion centred on the placement staff attitudes toward the student nurses, and of the students' consequential (un)acceptance and (dis)respect experienced on the ward. While these studies offer deeper insights into students' experiences of placement, these papers do not look at the nature of knowledge or how its application is mediated. Nor do they detail the methodology used sufficiently to explain the grounding of their research in the phenomenological tradition.

Rees (2013) reported on the phenomenon of learning through reflective practices of final year nursing students. The research was a robust, descriptive phenomenological study from an embodied lifeworld approach (Todres and Holloway, 2004) using the Giorgi (2009) method of descriptive phenomenological analysis. Ten students described their lived experiences of using reflection to learn through their clinical practice. The five constituents comprising the phenomenon were the developmental and maturing nature of learning through reflection, how the students responded to the emotionally challenging and often distressing aspects of nursing care, experiencing and making sense of real life situations of care, the refinement of students' values and beliefs, and the embodiment of the student as a nurse. The essence of the phenomenon was that students used reflection to make sense of happenings for understanding and to enhance their practice. They were committed to becoming the best nurse that they could, they examined and analyzed their own and others' attitudes and behaviours, and engaged in reflection to enable them to develop as professionals. Two findings of Rees' work that particularly struck me were that students need to be in touch with their affective domain, and that reflection plays a part in them becoming emotionally intelligent practitioners. These resonate with me because of the work already discussed by Koens et al. (2005) in sections 2.11 & 2.22, which highlighted that students need to invest effort in learning to gain the most out of learning opportunities, and that even if their commitment to applying that knowledge is high, unpredictable learning environment can test even the most engaged students. An awareness and development of their own skills and abilities of reflective practice should mediate in both situations. Descriptive phenomenology has not been the methodology of choice for most researchers of the lived experience, so Rees' work may be of value to me when I come to contextualise my own data. Rees' assumption was that healthcare students engage in reflective practice, and she sought to understand the students' lived experience of it. Through an inductive approach to my data analysis, it is possible that reflective practice may be revealed to me through the learning and applying of anatomy.

At the time of this review, I only found two studies of the lived experience of learning anatomy and they both used phenomenology as an approach rather than a methodology (McNamee et al., 2009, Tseng and Lin, 2016). Therefore, while they can offer some insights into students' experiences of the use of cadavers for learning, caution must be exercised over their broader transferability. McNamee et al. (2009) questioned ten medical students about the value they placed on post-mortem demonstrations in their medical course. The study concluded that anatomy learning was enhanced through the use of post-mortem examination as a learning strategy, a motivational factor for future practice through professional values

of respect and compassion, and a time to confront and reflect upon the emotional side of death. However, McNamee et al. (2009) analyzed their data using thematic analysis, and to interpret it they looked through the theoretical lens of Illeris' tension field of learning (Illeris, 2009). This is not within the principles of descriptive phenomenology, in which the data should reveal how the phenomenon appears to the participant in their own lifeworld, without influence from external agencies (Giorgi, 1985, Giorgi, 1997, Giorgi, 2009). Tseng and Lin (2016) reported on an investigation into the attitudes of twelve students towards human cadaver dissection. Data was collected through focus groups and analyzed using interpretative phenomenological analysis. The authors categorized students as either having a detached concern, which is the development of an emotional detachment from the cadaver enabling them to cope and function without reactions overshadowing their learning, or as having a more positive attitude that enabled students to remain concerned for the cadaver but out of a sense of deep respect, and to still be able to learn. These are useful findings and I have observed both these attitudes in students during our dissection sessions. There has been some historical debate around the use of focus groups for generating data in phenomenology (Bradbury-Jones et al., 2009, Palmer et al., 2010). The traditional view is that data should be of the experiences of individuals as they have lived through it (Giorgi, 2009). The alternative is that groups of participants can enrich data through collective reflection (Sorrell and Redmond, 1995). Bradbury-Jones et al. (2009) considered both arguments and concluded that whilst the phenomenological focus group can be appropriate, researchers who use it must do so critically and fully justify their approach. My criticism of Tseng & Lin (2016) is that they have not done this. Additionally, their paper did not capture data from the learner who objects to or dislikes learning with cadavers, meaning a full range of experiences was not therefore described.

2.32 Phenomenographic research

Some research that offers insights into my own phenomenon of learning and applying anatomy has been grounded in the phenomenographic methodology. In these studies the focus is upon the essence of the experiences across a larger group of participants, and the subsequent perceptions of the phenomenon by that group (Richardson, 1999).

An investigation was conducted into the ways in which pre-clinical medical students approached and organized their learning of anatomy. The findings revealed that participants created meaning of anatomy in three ways (Wilhelmsson et al., 2010). Through memorizing, students tried to make sense of the anatomy by remembering large amounts of information, recalling details of anatomical structures and grasping the language of anatomy. Through

contextualization, students developed comprehension of the complex interaction between the specifics of anatomical parts and the body as a single entity, also making sense of anatomy by making connections with their past knowledge and by relating it with other aspects of medicine and the human body. Through experiencing, students visualized anatomy using books, models and cadavers and trying to convert the two dimensional image into three. They made anatomy real by engaging with dissection through multiple senses and by seeing anatomy as a true representation of the human body. These findings are important if teachers wish to influence the noesis of learning, the use of the contexts in which anatomy is taught and learnt, and help students make their learning more meaningful (Moon, 1999). But these conclusions neglect the noema, the subject of anatomy itself.

The same authors looked for anatomy as the noema in their next study (Wilhelmsson et al., 2011). They asked senior medical students for their experiences of ‘taking on the subject matter’ in order to understand anatomy in practice. The findings described how some participants understood and selected appropriate anatomy through its association with other medical subjects, and for others anatomy use in medicine was enhanced by a deeper understanding of that anatomy. However, this would also appear to be the noesis of anatomy learning and one might legitimately conclude that the noema is indistinguishable as a separate entity. In trying to grasp something of the noema, Wilhelmsson et al. (2011) found that anatomy as a subject could only be understood through the contexts in which it was to be used. As such, students could not reach a full understanding of anatomy until they had experienced clinical practice much more fully. This supports my earlier argument that the noema and noesis are inseparable, see section 2.11, and that learning and applying are a single phenomenon in the context of professional learning. For Wilhelmsson’s early learners anatomy was disconnected, incoherent, and therefore held little meaning, but his later students of anatomy built a mental picture and turned their two dimensional ‘seeing’ into three dimensional understanding. They therefore became more proficient in anatomy. These more experienced students also used anatomical language as the mother tongue of communication in the professional context, which was in contrast to the participants of Wilhelmsson et al. (2010) for whom the language of anatomy was considered foreign. Wilhelmsson et al. (2011) stated that they felt the noema/noesis relationship was inseparable, and concluded that anatomy is learnt through both the perceptual understanding of gathering detail and storing information for future clinical use, and by the conceptual understanding of encompassing the dynamic, functional aspect of anatomy and its use in clinical practice. I agree with Wilhelmsson (2011) in this regard, and it is one reason I have conceptualized my phenomenon as I have. Whilst Wilhelmsson et al. (2011) went some way to describing the

student experience of ‘taking on the subject matter’, they did not present the full extent of the phenomenon of learning and applying anatomy, nor did they offer insight into how anatomy proficiency grew in their participants in the clinical setting. There is a gap in the thorough understanding of the relationship between noema and noesis that can be filled by treating learning and applying as one phenomenon.

A study by Bergman et al. (2013a) asked junior and senior medical students for a description of their experiences of anatomy and the different ways in which they understood it. As with Wilhelmsson et al.(2010), the memorizing of vast amounts of information revealed itself in this study, but in this case the motivation to learn was shown to be driven by the students’ anticipated or actual exposure to clinic. In this problem-based learning programme, students felt that learning for assessment purposes did not promote retention or recall of anatomy knowledge. Instead they advocated repetition of learning encounters with the building of topics from basic non-complex anatomy to more detailed anatomy in applied settings. This is the concept of a spiral curriculum proposed by Harden (1999), and could be a sensible approach to the application of a basic science to healthcare practice. An additional finding of Bergman et al. (2013a) was the students’ insecurity with regard to their knowledge, felt across all the student years, which gave them a sense of uncertainty and unease. They also experienced a general awareness of the relevance to and responsibility of anatomy in practice which lends legitimacy to the subject and speaks to the integrity and professionalism seen in students of healthcare courses. Finally, it was briefly reported that the students recognised the importance of anatomy and the necessity to apply it in practice, but the paper failed to discuss how this was achieved. My study is designed to reveal students’ experiences of the ways in which anatomy is applied in practice and thereby enhance what little literature I have found on the learning and use of anatomy in clinical practice.

A study into the students’ ‘journey towards understanding’ of pathology was conducted by Weurlander et al. (2016). They also wanted to understand how their students progressed from considering the subject as a collection of terms and details to appreciating it in the clinical context. The interviews and written accounts were thematically analyzed and four themes produced. There were some not unexpected similarities with the phenomenographic studies into the learning of anatomy, already discussed. The language of pathology was experienced as complex and vast. The participants reported making a map of the ‘whole’ to see how individual parts of pathology fitted. They paid attention to the details and stored them in their minds, and they experienced a deeper approach to understanding through making connections between facts and concepts, and old and new learning, resulting in a

sense of wholeness and coherence. The findings support the concept that learning only becomes meaningful when it is used in authentic and applied settings (Moon, 1999, Wilhelmsson et al., 2010, Wilhelmsson et al., 2011, Bergman et al., 2013a, Weurlander et al., 2016). However, more research is needed in the anatomy field to understand the connection between classroom learning and using that learning in the applied clinical setting.

This review of the literature has helped to provide a strong rationale for the way I am conceptualizing learning and applying anatomy as a phenomenon. The phenomenological, phenomenographical and other qualitative studies detailed above all demonstrate that meaningful learning is an endeavour by the student to understand the science of anatomy, relate it to what they already know, and transform it into something they can use (Nicol and Macfarlane-Dick, 2006). The findings provide some insights into the student experience and what students do to come to their understanding of anatomy in the clinical context. These studies have helped me explore my own research question. I am interested in how students experience the learning of anatomy, and use their understandings in the clinical setting in which it must be applied. I will do this by asking students for descriptions of their lived experience of the phenomenon of learning and applying anatomy, to understand what learning anatomy is like for them and how they use their anatomy in the applied setting of clinical podiatry.

2.4 Research Question and sub-questions of the research

In defining the phenomenon and giving consideration to the literature presented, I have laid out my a-priori knowledge, assumptions and experiences of teaching anatomy and observing students applying it in practice, and my own memories of learning anatomy for myself and using it in the clinical practice of podiatry. My intention for this research is not to arrive at a pre-determined outcome, but to enable the phenomenon to emerge from the data and show itself as being present. I will therefore adopt the phenomenological attitude and practice the reduction (Giorgi, 2009). This will be defined and discussed in the methodology chapter 3.0.

This selective conceptual review of the literature has revealed a number of matters where our knowledge of students' learning and applying anatomy in practice is lacking. These are:

- the need to investigate podiatry students and their knowledge and use of anatomy
- the need to hear the student voice through the literature regarding anatomy learning
- a more thorough understanding of the motivation to learn anatomy through the lived experience

- a clearer understanding of how dissection enhances or not a student's experience of learning anatomy
- the need for a deeper appreciation of the noema itself, that of anatomy as a subject
- the need to investigate the learning of anatomy from a student's perspective
- clarity around how authentic experiences, particularly through cadaver and case study work, lead to improved anatomical understanding
- a clearer understanding of how learning is achieved through classroom and other mediated teaching methods, and applied to real clinical practice
- the need for studies that centre on clinical application of knowledge
- a deeper understanding of theories around how students move from being a novice to a proficient clinician, via other stages of learning and application
- a deeper understanding of how students use anatomy in the assessment, diagnosis and management of patients in the clinical situation

The research question for this study is:

What are the lived experiences of podiatry students learning and applying anatomy?

By asking students for their lived experience of learning anatomy, I will gather concrete examples of how students took on the subject of anatomy based on their experiences in the classroom, dissection room and other mediated learning methods. In so doing, I will begin to understand how they are influenced by anatomy learning and teaching methods and consider how that might guide my own teaching practice.

Through their descriptions, I will seek to understand how students make sense of their learning of anatomy and how they apply it in clinical practice. I want to hear the student voice, and discover how they apply anatomy throughout their undergraduate education but particularly by the end of their course. By analyzing students' lived experience of clinical practice I want to reveal how students apply their anatomy in the clinical setting.

By interviewing students at both the earlier and later stages of the course, I will gather rich descriptions of their personal experiences of what learning anatomy has been like for them. I am interested in how they make sense of anatomy in the classroom and in the clinic, and how they use anatomy in clinical practice. The sub-questions were therefore:

1. How do three undergraduate students describe the experience of learning and applying anatomy throughout the podiatry curriculum?
2. What are students' lived experiences of learning and applying anatomy for podiatric practice?

Teachers enable students' acquisition of anatomy knowledge and facilitate its use in a clinical environment, but experiences are dependent on individuals' reality and their own making of meaning. I wish to understand this and look to make visible the ways of learning and applying anatomy. I will therefore ask undergraduate students of podiatry about their experiences of learning anatomy throughout the course, and about their application of that knowledge in clinical practice, in order to gain insight into the phenomenon, discover how it is for them to be taught anatomy, and understand how they experience anatomy application in the practice settings. This study will therefore be conducted using a descriptive phenomenological methodology.

3.0 METHODOLOGY

The purposes of this methodological chapter are to outline why descriptive phenomenology was adopted, to make a clear distinction between the philosophy of phenomenology and the scientific phenomenological method, and to discuss how methodological rigor has been achieved. It also justifies how the expressions of the lifeworld experiences of three participants offered deep insight into the phenomenon of learning and applying anatomy, and consequently the potential for seeing a new way of other similar lifeworld experiences. Finally, the chapter offers an engagement with the literature in relation to reflexivity in phenomenological method.

3.1 Human Science Research

Human science is the study of human existence as embedded in the domains of matter, life and consciousness (Polkinghorne, 1988). This study was concerned with students' experience, and by the meanings they made of those experiences through their engagement with the world (Giorgi, 1985, Giorgi, 2010). Human science research as it relates to the making of meaning aims to bring to awareness human phenomena, and an understanding of human experience (Polkinghorne, 1988, Van Manen, 2016). The nature of meaning is usually presented as an activity and is generally described through verbs, for instance to love, and to learn. Although human science research has modelled itself on that of the natural sciences of physics, chemistry, geology and biology, it would be problematic to study it by the same paradigms and methods (Denzin and Lincoln, 2011).

The central focus of this study was the understanding of the lived experiences of podiatry students about learning and applying anatomy. To gain this understanding and be able to articulate the structure of the phenomenon, I needed to ask students who had experienced the phenomenon to describe those experiences and the meanings they made of them. There are other ways to capture student experience, and other reasons for gathering participants' narratives (Creswell, 2012). Ethnography, for instance, focuses on the behaviours of a culture-sharing group; in the context of my research this would be a cohort of students sharing the culture of being a learner of anatomy on the podiatry programme and data would have been gathered by participant descriptions. But in this kind of study the cultural issues would have been sought by the examination of particular patterns of behaviour of the cohort in learning and applying anatomy, and the functions of groups subsequently described (Wolcott, 1999). Case study research is designed to explore an issue or a problem of a bounded case, perhaps students in the first year of the podiatry programme at the University of Brighton, and again, description would have been gathered. The case study would have

been informed by detailed context of the cohort, the curriculum, the module and the clinics, and by literary material such as university policies, professional standards, and module handbooks. Generalizations would have been made of this case and how the cohort as a whole learned and applied anatomy, and this may have shed light on the understandings of other situations (Stake, 1995, Yin, 2013). But this would not necessarily reveal the nature of the learner and their experience of learning anatomy and applying that theory to practice. Both ethnography and case study could answer questions about how students learn and apply anatomy to practice. However, because of the wider aims such approaches often have, they may arguably be less focused on revealing the phenomenon as lived by the participants. My intention was to reveal human experience through an inductive process. Using some of the principles of the philosophy of descriptive phenomenology, I chose to study the student experience of learning and applying anatomy such that I could reveal the structure of the phenomenon.

The intention to reveal the structure of a phenomenon is not unproblematic. In the sections that follow I will explore this further, first by delineating some of the philosophical origins of descriptive phenomenology and how they lent themselves to this research (sections 3.2 & 3.3), and then distinguishing between these philosophical origins and the implementation of descriptive phenomenology as a robust scientific method (sections 3.4 & 3.5).

3.2 Phenomenological philosophy as attributed to Husserl

Phenomenology is the study of the structures of a phenomenon as lived by a person and as it appears to their consciousness (Giorgi, 1985, Moran, 2002, Todres, 2005). This is a first-hand experience, and is captured through description, concrete examples of the persons' experiences as lived through their own physical, emotional and intellectual being-in-the-world (Van der Mescht, 2004). We gain experiences and acquire familiarity with them through our way of living, actions, narratives and reflections of our lifeworld. Phenomenology assumes this familiarity and engages it (Benner, 1994).

Edmund Husserl (1859-1938) is considered to be the founder of phenomenology. His background was in mathematics, but the issues of human perception and conscious awareness greatly interested him. Moran (2002) suggested that the book *Logical Investigations* was the means by which Husserl explored his understanding of philosophy, and communicated a series of detailed descriptions from his own different world viewpoints. He later abandoned this philosophy in favour of phenomenology. He classed phenomenology as a new radical thinking that sought to understand how a 'given' might

appear to a person's consciousness from the perspective of the person undergoing the experience (Giorgi, 2009). Husserl wrote of it as 'careful description of the 'things themselves', that is the ideal objectivities which constitute meanings' (Moran, 2002 p.74). Husserl believed that to get to the essence of the phenomenon, the researcher must understand it from its core. The phenomenon is accessed through the description given by the person to whom it appears in consciousness, and their natural attitude towards it. Husserl called this descriptive phenomenology. To practice descriptive phenomenology with its basis in philosophy, there are principles that should be attended to.

3.3 Principles of the philosophical phenomenological method

Phenomenology as rooted in philosophy is a reflective discipline. People generally do not reflect on their experience of the everyday phenomena of life while living through it, only perhaps retrospectively. Phenomenology encourages reflection through recollection and description of that lived experience which has already passed. Polkinghorne states 'a true reflection on lived experience is a thoughtful, reflective grasping of what it is that renders this or that particular experience its special significance' (Polkinghorne, 1988 p.32). Put another way, phenomenological research is that which brings into nearness something which we would not ordinarily tend to, that is not in our natural attitude of the everyday and that we bring to the fore through reflection to reveal the nature of the phenomenon. There is no published article on the phenomenon 'learning and applying anatomy' as perhaps it is not in the everyday consciousness of students, lecturers or clinicians. It is therefore a highly suitable phenomenon to be studied within the philosophy of phenomenology, but to do this it is necessary to adhere to some key principles of phenomenology as a method.

3.31 Philosophical principle of the Lifeworld

Within the philosophical basis of phenomenology, the 'lifeworld' is the common everyday world of human existence (Todres, 2005). It is the ordinariness of the everyday (Giorgi, 2009). It is the meaning things have as lived through our own selves, our interaction with others, and through the passing of time (Finlay, 2002). What characterises phenomenological research is that it is always rooted in the lifeworld, which is described by Husserl as pre-reflective and pre-theoretical (Moran, 2002). The participant will experience the phenomenon as lived in their own lifeworld, the world as known through their own lens and frame of reference. They will have a 'natural attitude' towards this phenomenon, which is a way of seeing in the every day. Research methodologies which start with a theory and aim to position their data relative to that theory to inform it, do not align with the lifeworld

experience of descriptive phenomenology. Phenomenological research does not construct new narrative, it merely reports existing ones (Polkinghorne, 1988). This is a philosophical ontological position of a person's being in the world, of how it is for them, and of how the phenomenon appears to their consciousness. It is also the stance of humanism, a concern with the needs, wellbeing, and interests of people (Guba and Lincoln, 1994). Descriptive phenomenology seeks the essence of the phenomenon as it is lived and as such the practice comes first (Mastain, 2006, Kelly and Ahern, 2009, Vuoskoski, 2014). Phenomenological research data is enlightened by theory but only once analysis has been undertaken and reflected on.

From the perspective of the aims of my research, to understand podiatry students' experience of learning and applying anatomy, Husserl's conceptualisation of lifeworld seemed appropriate in terms of the philosophical underpinning of my methodology. Individuals' lifeworld of existing in ordinariness is what Husserl termed their 'ground world' (Giorgi, 2009 p.11). Living through the commonplace of the ground world, people also occupy specialized worlds. Podiatry students experience learning and applying anatomy through the specialized world of education, this world of education being a component of their ground world. They know they will be taught anatomy and that it will play some part in their professional practice. They take for granted the ordinariness of being in a classroom and do not think on this process, they merely know they are there to learn. They recognise that they are living through a complexity of intersecting specialized lifeworlds as a wife, mother, daughter, but also a learner, colleague and practitioner. Through this research, I have paid attention to their specialized world of learning and how it shapes their practice. Moran wrote that Husserl believed a 'basic interrogation of these (other worlds would reveal) the invariant structure of the lifeworld' (Moran, 2002 p.182). No other researcher has sought the podiatry student experience of learning anatomy in this way, nor aimed to find the essence of what it is to learn and apply anatomy for podiatry.

3.32 Philosophical principle of the natural attitude

In philosophical phenomenology the natural attitude of is the normal, worldly consciousness and everyday approach we take to the world in which we live (Moran, 2002, Giorgi, 2009). In anatomy terms, it is the taken-for-granted way in which the students engage with the subject within the contexts of their lifeworld. Husserl believed that we interact with the world through our sustained experience of it, and that it is through this sustainability of our sense of reality that we also practice a concurrent forgetfulness. This he termed a 'blind spot', believing it enables us to experience life as a fundamental belief or strongly held conviction

(Morley, 2010). For Husserl, the blind spot is the thesis for our natural attitude. Using Husserlian principles, to study a student's natural attitude towards learning and applying anatomy, the researcher must scrutinise their own 'existential position towards the world' of anatomy education, and withhold the positions they take towards that world (Morley, 2010 p.225). He called this the phenomenological reduction.

3.33 Philosophical principle of the phenomenological reduction

Husserl argues that in order to enter another's experience, such as what it is like to learn anatomy, one has to practice phenomenological reduction. The first reduction is to adopt what Husserl believed to be the *phenomenological attitude*. From the philosophical perspective of phenomenology it is argued that students would have a natural attitude towards learning and applying anatomy, and as the researcher, I needed to see the phenomenon only as it appeared to them. To adhere to the phenomenological attitude, I therefore had to examine my own attitude towards the world, the subject, and my own experience of learning and applying anatomy. By adopting a scientific methodological process I was required to take on the disciplinary attitude of education, become open to the participants' experiences and to the understandable meanings implicit in them (Finlay, 2008, Finlay, 2009, Morley, 2010). I discuss reduction from the perspective of the scientific method in more detail in section 3.5.

The second reduction is *epoché*. Husserl insisted that the researcher 'bracket out' all of their pre-known presuppositions, assumptions, beliefs and theories about the phenomenon, so that they may scrutinise the data for the essential meaning of the phenomenon being studied. This is not to say everything known about the phenomenon is forgotten, but that this past knowing is not engaged (Giorgi, 2009). Whilst the concept of bracketing is a philosophical principle it also had pragmatic implications, which I discuss in section 3.62, but in short, it permitted me to examine my own experiences of being a teacher and a student so that I could identify influences of my own meaning making on the descriptions of the meanings made by the students of my study. In so doing, I could be as sure as possible that I was describing the phenomenon as whatever or however it appeared to them.

The third reduction is the *eidetic*. Continuing to align with the philosophical position of phenomenology, Husserl believed that collective meaning can be gathered from individual knowing, so that the phenomenon should be considered not merely as the individual experience of the essence, but as yielding "absolute evident insight and universal truth (Moran, 2002 p.134). This is problematic. I shall not assert that one study into a few podiatry

students' experiences of learning and applying anatomy can offer the universal truth for all students in all learning situations. What I do offer is an insight into several lifeworlds for others to examine and perhaps with which to share some familiarity. To do this I employed eidetic reduction. The eidetic is to "vary all the factors that would have an effect on the specificity of the object, in order to know more precisely what makes the object a specific example or instance of the type of phenomenon it is" (Vuoskoski, 2014, p.63). Close attention should be paid to the individual descriptions of experience, examined from all aspects, and intuited down to that which speaks as most loyal to the original meaning. The phenomenon, comprised of invariant parts, can then be reduced to its essence, or structure. To feel able to defend this philosophical goal from critics, Husserl engaged in *imaginative variation*, the interrogation of an act of consciousness by comparative examination to explore and articulate its meaning. Philosophically, the use of imaginative variation to establish the essence of a phenomenon could be open to question, but pragmatically this allowed me to verify my data through checking and re-checking the analysis to ensure that each part was a constituent, and that the essence could not be what it was without that constituent. Once this was established, I was able to describe the essence of the phenomenon. I discuss this in more detail when I explain my use of phenomenology as scientific method.

3.34 Philosophical principle of intentionality

Husserl was interested in the 'intentionality' of the phenomenon. He believed that there was an 'aboutness' of every human experience: to love 'of' something, to see 'of' something, and he sought to illuminate this to find its mode of being, for consciousness (Moran, 2002). His approach was to gather rich description from people who had experience of the object, and discover the characteristics of the phenomenon without which the object would not be what it was. He could then communicate the essence of that object as it appeared to people in their lifeworld. This is an epistemological stance; knowing through intentionality and consciousness, the deeper meaning of subjectivity itself.

I sought to employ a method of phenomenology that would facilitate me to critically appropriate the pragmatic aspects of the principles of Husserl's philosophy of life world – natural attitude, reduction and intentionality – in a way that added to the scientific robustness of my study. I needed to direct my students' consciousness at the aboutness of anatomy knowledge and its application. They would need to describe their experiences of learning and applying anatomy and the meaning they attributed to them, from the perspective of their own lifeworld and in their natural attitude. I sought the intentionality of the phenomenon through both rationality and phenomenological reduction. It was therefore appropriate that I

chose the descriptive phenomenology of scientific method according to Amedeo Giorgi (Giorgi, 1985, Giorgi, 1997, Giorgi, 2009).

3.4 Towards descriptive phenomenology as scientific methodology

In section 3.3 I explored the philosophical basis of phenomenology signposting how, from the perspective of my objective, I was able to draw on Husserl's philosophical principles. I now turn my attention to the discussion of phenomenology as scientific methodology and the implementation of descriptive phenomenology as a robust scientific method.

Descriptive phenomenology as a method uses language, usually through interview narrative, to articulate the intentional objects of experience (Giorgi, 1997). The evidence of intentionality is whatever presents itself in the description, and it is described according to that description. The lived experience is a way to examine and understand the meaning of everyday experience, the way the phenomenon is experienced, as an inductive intention. If one were to go beyond the evidence of intentionality, the phenomenologist would be moving into the realms of interpretation (Giorgi, 1992, Todres, 2005). Humans naturally self-interpret and the descriptive phenomenologist seeks to describe that self-interpretation, not explain it.

3.41 Applying the philosophical phenomenological principles

While the description is given by the participant, it must be examined by the researcher for whom a different lifeworld exists. To see the data for what it is, and to refrain from influencing the narrative with the researchers' own insights, the researcher must attempt to adopt Husserl's phenomenological reduction (Giorgi, 2009). The data may then be seen from the perspective of the researched and so that the researcher does not 'understand too quick(ly), (or) too careless(ly)' (Dahlberg, 2006 p.16). Husserl wrote of bracketing as a "bringing the richness of our insertion into the world to light in a new manner" (Moran, 2002, p.79). There are arguments to suggest that bracketing is not in a researcher's power to do. Researchers are a part of this world, so they cannot truly break with their way of seeing it. The alternative view is that researchers' prejudices are set aside (Walsh, 2003) and they see with a fresh pair of eyes when analysing the phenomenon being described (Finlay, 2013). Finlay (2009 p.12) suggested that the researcher explicitly acknowledges their potential influences by bringing a 'critical self-awareness of their own subjectivity, vested interests, predilections and assumptions', and is conscious of how their pre-knowings might impact on the research process and findings. Whatever the philosophical argument about the possibility of realization of bracketing, it nonetheless remains a valid aspiration in terms of

challenging one's own research biases and assumptions, particularly as an experienced practitioner. Throughout this research I have attempted to make explicit my own interests and prior understandings, explained how I laid these aside to see my data afresh (section 3.62), and been reflexive (section 9) in my discussion about how any personal agenda may have influenced the study. This demonstrates rigor of thought to the process, and I discuss this in detail in section 3.6.

Giorgi argues that consciousness has a noemic/noetic construct (see 3.51), and descriptive phenomenology embraces the difference between the concretely experienced noema (the object), and the noesis as the subject of consciousness (Giorgi, 1992). An event or thing may be experienced differently by different participants. Each may see it as a positive or negative, a like or a dislike, and so on. Descriptive phenomenology does not try to distinguish between those opposites, but rather embraces the variation. Descriptions reveal the structure of the phenomenon as it is experienced, the structure being the commonality that is present throughout the many iterations of the phenomenon. The descriptive phenomenologist teases out the unified meaning of a structure as it presents itself, to account for and give relationship to that variation. This structure is revealed as a making of meaning, and the researcher discloses the nature of the structure as expressed through that meaning. From this structure, a deeper and fuller understanding of the phenomenon in question will result (Hein and Austin, 2001). The aim of my research was to articulate the structure of the phenomenon of learning and applying anatomy as it appeared to podiatry students through their descriptions. It was possible that a spectrum of experiences might show themselves, as learning anatomy for some brings a positive response and from others, a negative. The structure would capture that variation and present a unified composition that would represent the wealth and depth of experience of the phenomenon.

3.42 Phenomenological methodology as applied to this research

There is no totally unified method of conducting phenomenological research, "rather the specific method used depends on the purposes of the researcher, (their) specific skills and talents, and the nature of the research question and data collected" (Hein and Austin, 2001 p.3). A number of diverse approaches to descriptive phenomenological research have been employed. In addition to Husserl's philosophical transcendental approach (Moran, 2002), there has been Dahlberg et al.'s (2007) reflective lifeworld approach to human caring, Van Manen's (1990) education science enquiry, Halling et al.'s (2006) dialogal approach to forgiving and forgiveness, Todres' (2005) embodied lifeworld approach to health and social care, and Ashworth's (2003) lifeworld approach to studying. Whilst each has its own

particular focus, they all align relatively closely with Husserl's philosophy of reduction and imaginative variation (Finlay, 2009). Husserl's reduction is one of the reasons I chose descriptive phenomenology. I am a very experienced and long-standing practitioner in the field of learning and applying anatomy, so I needed to challenge my own assumptions about the phenomenon built up over my years of practice, and to try to bracket out my own interpretative attitude. I wanted to make the familiar strange again, and see it from the perspective of my students' lifeworld.

Hermeneutics is the theory of interpretation, and allows researchers to read and understand experience through analysis of language, time, context and human relations. The key for interpretivist phenomenologists is to account for a phenomenon through the plausible attribution of meaning given in a description. This is not exclusive, and allows for the possibility of other accounts that can be made of the same description. The result is an idiographic interpretation of a phenomenon through a theoretical perspective which embraces and emphasizes the diversity of the accounts (Giorgi, 1992, Moran, 2002, Smith et al., 2009, Van Manen, 2016). Philosophically, descriptive and hermeneutic phenomenology are seen from different perspectives. Descriptive phenomenology is concerned with knowledge as concrete, the structure of the phenomenon representing a universal truth and the construct of subjective realism. Interpretive phenomenology has its epistemological orientation towards interpretivism, and through a relativist position of *being in the world*. I have chosen descriptive phenomenology over interpretive as descriptive phenomenological research searches for description of the meaningful lived experience of the phenomenon and is used when the researcher wishes to extract the concrete descriptions from the narrative to use as explicit examples of how the researched made their events and actions meaningful. Hermeneutic phenomenology is the interpretation of the meaningful lived experience using a mediator, which is more often than not, language. Gadamer (2008) distinguished between the two approaches by suggesting that descriptive is a *pointing to* something to let it show itself, whereas interpretive is a *pointing out* the meaning of something. From my perspective the phenomenon of learning and applying anatomy for podiatry has not previously been studied. It therefore made sense for me to use descriptive phenomenology over interpretive, in order to try and first explore and establish the structure of the phenomenon of learning and applying anatomy for podiatry students.

In descriptive phenomenology, the participants' narrative is described in its 'incompleteness (and) in its contradictory status' (Giorgi, 1992 p.127). The descriptive researcher does not wish to go beyond the data, neither do they wish to add meaning to or try to give meaning

to that which is described. Phenomenological research questions are meaning questions. However, the core of the lived experience is difficult to describe and is always more complex than the phenomenological structure can reveal. Phenomenological research questions are also not a problem for fully resolving, so may never be closed down and always remain the subject of debate and reflection (Todres, 2005). There is a freedom about expressing the uniqueness of experience through structures that allow for possibility and variation. Although I later express the phenomenon of learning and applying anatomy as a general structure (section 4.2), that structure was based on three students of podiatry, and how that structure was lived by them. I therefore tried to communicate ‘a richer and deeper understanding of that (structure)’ within the studied context (Todres, 2005 p.110).

I found the distinction between descriptive and interpretive phenomenology problematic. I initially failed to understand how discussing students’ experiences as they described them could not include an element of interpretation, and equally, how can one interpret an experience without describing something of its appearance. Two independent research papers, Hein and Austin (2001) and King et al. (2008) demonstrated that in fact all phenomenology was essentially both descriptive and interpretive. To support this theory, they analysed a piece of phenomenological data using both descriptive phenomenological and hermeneutic methods. The outcomes showed a “considerable degree of similarity” (Hein and Austin, 2001, p.13) and only differed where there was a fundamental difference in the underpinning theoretical and philosophical assumptions (King et al., 2008). The likeness was considered encouraging, going some way to quelling the rivalry between the practitioners of the two philosophies, and permitting some latitude to the discussion of the descriptive analysis in order to draw out the conceptual and contextual elements of the phenomenon.

The approach I have taken, and shall describe in the next section, is that of a scientific descriptive phenomenological method, so as to reveal the structure of the phenomenon that is general for a particular group of people (Giorgi, 2009). I have sought to provide a phenomenological insight into how students’ knowledge and skills of learning and applying anatomy have contributed to their overall clinical competence and have advanced their ability to provide clinical care. If I have succeeded in capturing the students’ descriptions well, my structure should be compelling and insightful. But the very nature of my researching, of the students ‘knowing’ they were being researched, has changed the nature of the descriptions from being *of* the lived experience, to being *of the expressions of* the lived experience. This descriptive existential phenomenology (Polkinghorne, 1988, Hein and

Austin, 2001) is a reflective process using thought and knowledge to ‘make itself knowable to itself’ (Van Manen, 2016 p.17) and is a legitimate method by which to gain access to the phenomenon as it was lived (Giorgi, 2009).

3.5 The Scientific Descriptive Phenomenological Method

Giorgi drew on the principles of Husserl’s philosophy, and offered a practical process for researchers engaging in scientific study to apply the descriptive phenomenological method (Giorgi, 1997). Science is the study of the nature and behaviour of entities and the knowledge obtained about them (Polkinghorne, 1988), and in studies such as mine the research must be conducted in a robust and methodical way. To see the phenomenon for what it was, I had to adopt both a scientific, and an educational perspective (Giorgi, 2009). Education is the activity of teaching and facilitating learning through the pedagogy of formal and non-formal environments (Eraut, 2009, Van Manen, 2016). Giorgi adapted Husserl’s layers of reduction for his own purposes of understanding experiences relevant to psychology, as applied to humans in a scientific context. My own discipline is healthcare education, so I substituted Giorgi’s psychological focus for a focus on healthcare education (Giorgi, 1985). By adopting the phenomenological disciplinary attitude of education, I was able to bring a pedagogical sensitivity to the analysis (Giorgi, 2009). I took Giorgi’s scientific approach to gathering data by asking students to give me concrete examples of their lived experience of the phenomenon. They chose the examples, and by means of a narrative described them to me in their own natural attitude as lived in their lifeworld. I wished to understand the students’ experiences from their natural attitude, as lived and described by them, and to focus on their reality. I took an educational phenomenological attitude, and practiced epoché to put aside all my assumptions of learning and teaching anatomy, and my understandings of putting knowledge into practice as a podiatrist. Through eidetic reduction and imaginative variation (section 3.33), I sought to identify the characteristics of the structure of the concrete experiences of an educational phenomenon. That is, the meaning of the educational phenomenon expressed as its constituent parts, each part being essential and without which the phenomenon would not exist. I have therefore engaged with Giorgi’s method as outlined below, and applied it in the educational context:

1. Assume the phenomenological reduction by (a) the adoption of the phenomenological attitude to see the phenomenon only as it appears to the participant, (b) epoché; the bracketing out of all presuppositions, assumptions, beliefs and theories pre-known about the phenomenon.

2. Listen to and read through the transcript multiple times to get the overall impression of the data.
3. Break the data into meaning units, simple lifeworld descriptions separated into parts whereby a transition in meaning is established.
4. Translate each meaning unit into a psychological aspect of the description, or in my study an educational aspect of the description with my own phenomenon in mind. Apply the eidetic to verify the data through checking and re-checking the analysis, to imagine the appearance of the phenomenon in context.
5. Reduce all of the meaning units into their most general psychologically (for me, educationally) explicit meaning, to determine the whole textural descriptions of the experience, and through the eidetic, synthesise the constituent parts into a single structure.
6. Apply imaginative variation to verify what is and what is not truly essential to the structure of the phenomenon for this context.

3.51 The Noema–noesis relationship

As previously mentioned in section 3.51, consciousness has a noemic/noetic construct (Giorgi, 1992). The noema–noesis relationship is about how student participants viewed the object (noema) of anatomy and its application, and how they constructed the meaning of that object through the subject of the learning contexts (noesis) (Crotty, 1998, Greasley and Ashworth, 2007, Giorgi, 2009, Van der Mescht, 2004). Giorgi stated that “the articulation of this relationship within the framework of consciousness or experience is what raises the possibility that the task of description could be rigorous” (Giorgi, 2009, p.105). In being sensitive to the act of learning as it appeared in my students’ descriptions, and the object of that act which was anatomy, I could hold the noema and noesis apart and analyse and describe the phenomenon from my educational perspective. This approach to data analysis permitted me to see the lived meanings of the phenomenon from the perspective of the experiencer, and be insightful, perceptive and discerning in revealing the depth and richness of the phenomenon. The interviews allowed me to reveal the participants’ individualism, explore the varied and multiple meanings that emerged, and make known how the students worked with these meanings through their own social and cultural frames of reference. I stayed faithful to the phenomenon of my study, learning and applying anatomy, and did not get misled or distracted by narrative that did not speak to my phenomenon (Van Manen,

2016). In the following section I will set out some of the tensions around rigour and reflexivity in phenomenological research.

3.6 Quality in phenomenological research

A good deal of qualitative research in medical education has reduced the experiences of students in learning, teaching and assessment of anatomy to measures of outcomes, comparisons of methods, and improving achievement. However, phenomenology is about meanings, and these cannot be handled, measured, or controlled as natural objects can, and are not governed by natural laws. Greenhalgh and Taylor (1997, p.740) discussed the importance of studying health science through qualitative methods and called for more research to be conducted so that “the complexities of human behaviour” can be better understood. There is a plethora of research that addresses general education from both positivist and interpretivist paradigms, using a range of methodologies. Researchers in the field generally have the same starting point, guided by standards, and the desire to produce work of quality, relevance and use.

Polkinghorne (1988) advocated measuring qualitative research for rigor, robustness and authority. Lincoln and Guba (1986) for truth value, consistency, neutrality and applicability. Phenomenology cannot, however, be scrutinised using these same criteria (Dahlberg et al., 2007), so the question is therefore how should it be scrutinised?

Phenomenology is: systematic in that it is conducted through questioning, reflection and focus; explicit in that it articulates a structure of a lived experience; and self-critical in that it constantly challenges itself to examine its own strengths and limitations (Finlay, 2009). Descriptive phenomenology as a method is assumed to be a qualitative paradigm of the interpretivist orientation, but this may be a false supposition. It is qualitative as it seeks the meaning of a phenomenon, but through the subjective description of a person’s lived experience of that phenomenon. A phenomenologist is looking for an essence of something, a universal truth. These assumptions could be argued to be more aligned with positivism.

In general terms, judgements are made about the soundness of a piece of research through the appropriateness of the study design, the rigor of the research practice, the justification of the methods used, the truth of the findings to the participants, and the integrity of the outcomes (Mays and Pope, 1995, Todres, 2005, Noble and Smith, 2015). In phenomenological research it is important that the process be applied in a rigorous and consistent way. The philosophy, methodology, and methods adopted by the scholars of the phenomenological paradigm, although perhaps and justifiably adapted, would be employed

not merely at the findings stage, but throughout. In this way, credibility is more likely (Todres, 2005). For this study, I adopted some of Husserl's philosophical principles as discussed in section 3.3. I followed the systematic scientific descriptive phenomenological method of data collection, analysis and presentation as expounded by Giorgi (2009), and engaged in a reflexive dialogue around these values. What follows in the next section is an interrogation of the principles and practices of conducting a robust descriptive phenomenological study.

3.61 Phenomenological descriptions of the lifeworld

Qualitative research usually involves finding a representation of a population from a sample. In phenomenology, the aim is not to find breadth, but to study the depth of the appearance of a phenomenon to the consciousness of the participants. My students self-selected, and although they did not represent every facet of society, they were representative of a University of Brighton podiatry cohort (section 1.614). My aim was to understand the phenomenon of learning and applying anatomy as lived by those undertaking the undergraduate podiatry course. These students offered me the opportunity to follow them over three years, contributing to the richness and depth of the data.

The aim of descriptive phenomenology is for the description to capture the essence (Rose et al., 1995). There must therefore be enough variations in the data gathered to allow the determination of what is essential to the phenomenon and what is not. It could be argued that to acquire the diversity of learning approaches and experiences students might use in acquiring knowledge, skills and understanding of anatomy, more than three participants would be required. Malterud et al. (2001) suggested that arguments about sample size often default to being more concerned with samples being too small than being too large, instead of appraising the outcome of analysis. My argument, supported by Giorgi (1992), Todres (2005), Finlay (2009), and Englander (2012) is that the aim of phenomenological research is to gain a better understanding of a phenomenon through human experience, and not of the individual experiencing it. It is about achieving representation of the phenomenon, by finding people for whom the phenomenon has become apparent and who are capable of describing their experiences of it. It is about discovering and analysing the idiographic, doing analysis in sufficient depth to find variation in the descriptions, and revealing the commonality between them to find the essence of the phenomenon such that a final plausible structure can be assembled. Any analysis which identifies individualism is dismissed in favour of those characteristics that go across all descriptions.

My study was of a longitudinal design. The students were learning and applying anatomy through three years of education and I was therefore interested in their lived experience over time. I followed three individuals through their undergraduate degree, and mapped the experience of learning and applying anatomy as it was lived. I believe this number of participants produced data that was 'uniquely adequate' for this phenomenon to be revealed (Psathas, 1994 p.51, Todres, 2005, Giorgi, 2009).

Many experts of qualitative research agree that the appropriate number of interviews is achieved when saturation has been attained (Baker and Edwards, 2012). However, this is a challenging approach as it would necessitate the researcher to move between data collection and data analysis, melding them rather than treating them separately (Bryman, in Baker and Edwards, 2012). From a phenomenological perspective this approach would necessitate finding the commonalities of the phenomenon between subjects then testing the structure by asking more participants. This would interrupt the flow of the descriptive phenomenological method and the researcher would need to compromise the reduction. Giorgi (2009) discussed a minimum of three participants as appropriate, also suggesting that interviewing them multiple times would strengthen the data. Todres (2005) suggested that anything more than one would offer opportunity for intuiting the essential structure and a more effective communication of that structure. He went on to say 'Three good descriptions is better than twelve poor ones' (Todres, 2005 p.110). Analysing more data would arguably produce more variations, but it is more important to discover how the phenomenon presents, rather than have multiple people describing it. Ultimately it is the depth and richness of the interviews that is important, and the 'dignity, care and time taken to analyse' them (Jensen, in Baker and Edwards, 2012 p.5). Having interviewed the students up to four times each, my data analysis exposed the phenomenon on numerous occasions in each interview, as identified in the findings of this study for each constituent part (chapter 4). Malterud et al. (2016) discussed the issue of sample size in qualitative studies. They proposed a model to guide a researcher to a suitable sample size through a concept of information power. They proposed five items for consideration, each on a continuum: the aim of the study from narrow to broad; sample specificity from dense to sparse; whether there is established and applicable theory or not; the quality of the interview dialogue from strong to weak; and the analysis strategy from single case to cross-case. The sliding scale of each item determines whether a higher information power warrants a smaller sample size, or a lower information power directs the researcher to a larger sample size. Applying this model to my study, the information power erred on achieving a higher information power, so the guide supports the use of a smaller sample size.

As with any research utilising human participants, consent was obtained prior to the start. The interviews were unstructured, which permitted the students to say anything that was of importance to them and was in their consciousness. The interviews were transcribed verbatim, and the students were all sent their data transcripts for checking. Todres considered that the 'researcher is accountable to the respondent to the extent that the original interviews or accounts are accurate and faithful' (Todres, 2005 p.111), so it was important to me, and vital for the integrity of descriptive phenomenological research, that I had transcribed their narrative as they had said it, and that punctuation was accurate throughout. Giorgi is quiet on the subject of checking transcripts, although he has much to say on his rejection of member-checking the results (Giorgi, 2008). Each student agreed that the transcripts were an accurate written recording of their words, and that they reflected their experiences. They also said how useful it was to read it through. One of my participants, Janice, particularly expressed how much she benefited from reading it, particularly now that she was in professional practice. For quality standards, this confirmed that the data was plausible for the participants.

The three students came from vastly different social, economic and experiential backgrounds (please see appendix 1 for their biographies). Although all had a prior degree, two were not aligned with healthcare and the third was obtained in a non-university environment. Two of the three had learnt anatomy for previous qualifications. One of the students was a nurse, and claimed she had not retained any of that anatomy learning and was learning it afresh. She also stated categorically that she did not use anatomy in her current nursing practice. The other student had learnt a little anatomy for an alternative medicine qualification. This was in far less detail than a student podiatrist is taught and therefore was approximately on par with other students of her cohort who had studied a little anatomy prior to the commencement of the podiatry degree. My knowledge of these three students positioned me as an insider researcher, a concept I shall now detail.

3.611 Insiderness and researcher positioning

Throughout this study, I had a-priori familiarity with the context of my research (Hellowell, 2006). This inherent understanding of the setting and context allowed me to understand subtle description, and link up situations and events I may otherwise have missed, or misunderstood. However, it can also cause challenges and complications and blind me to new ways of thinking. I therefore needed to establish both inside and outside sympathies to my participants. That is, to be sensitive to the environment and the nuances my subjects described, but also set myself aside from them. I adopted the phenomenological attitude in

order to hold in abeyance my a-priori knowings, and examined my data from a phenomenological perspective. Finlay (2013) specifically states that the phenomenological reduction enables the researcher to estrange themselves from the knowns and see the data with fresh eyes.

I had a lived familiarity with the group of students I interviewed and we co-existed in this research (Mercer, 2007). I had worked with these students of podiatry, teaching them in the anatomy classroom, dissection room and clinical environment. It was therefore possible that they described for me their lived experiences in much more detail as I was empathetic to their situation and experience. This is considered by some scholars to be an advantage (Hockey, 1993, Hellawell, 2006) as it negated any awkwardness or perplexity of the situation and gave me a “direct, intuitive sensitivity that alone makes empathetic understanding possible” (Merton, 1972 p.15). Conversely, however, my greater familiarity could have blinded me to the obvious, left some experiences intentionally unexplored by the participants, or some seemingly shared cultural or clinical norms not expressed (Platt, 1981). To mitigate against this I examined my data eidetically, that is I ‘methodologically engaged imagination to vary and interrogate the objects (I was) striving to understand (Morley, 2010 p.226). In the end, it is the meaning these students make of their experiences that matters, not the manner in which they choose to articulate them (Giorgi, 2009).

The fact that I had this familiarity with the students also served to strengthen my credibility with them as a researcher. I already had a good rapport with them, another advantage of being an insider researcher (Hockey, 1993). I was able to gauge the honesty of the responses, reflexively giving consideration to my own influence on the data collection throughout the reduction. However, conversely my assumptions may have been unchallenged, and my students may not have shared certain information with me for fear of being judged (Mercer, 2007). I have identified and made known the positions I hold about learning anatomy in the classroom, and students’ ability or not to apply it in the clinical situation, as demonstrated in both the conceptual literature review and this methodology chapter, and I therefore believe that I had addressed my possible biases and had put them in abeyance.

Inevitably, there was a power relationship between my participants and me. The first interviews I conducted were in year one and we still had a professional relationship to continue thereafter. It is possible they may have conducted themselves in a far more reasonable manner than they might have wished, had they felt some subjects controversial. By year three, I had the familiarity with them as discussed above, but I also feel that we all had a mutual respect for our positions in the degree course, our expertise in and out of the

clinic, and for anatomy as the subject of the research. How these power relationships influenced the interviews, I shall never know. However, I believe the strict scientific methods by which I analysed the data had the effect of negating these influences, as I would only be extracting that which spoke to the phenomenon of learning and applying anatomy, and only to reveal the students' lived experience of this phenomenon.

In this discussion on insiderness I have argued that adhering to the principles of reduction, and systematically following the scientific descriptive phenomenological method, mitigates against researcher influence in the study. The next sections explore how and why this can also be claimed for the assurance of quality phenomenological research.

3.62 Phenomenological reduction

In adhering to Husserlian principles, it is required that the researcher applies the phenomenological attitude, and practices reduction rigorously (Morley, 2010). Epoché is very hard to do and critics of phenomenology have claimed that it is not actually possible (Rose et al., 1995, Giorgi, 2009, Van Manen, 2016). Finlay (2013) suggested that to practice epoché we should take a fresh look at the world, that we open ourselves to the 'other', and that we look from a different perspective. Epoché is an attitude not a formulaic process, and researchers using phenomenology should not just do this as a step in analysing the data, but should take this approach to the whole research process (Ashworth, 1996). I practiced epoché throughout the research process. I identified and made known my a-priori knowledge and understanding of the phenomenon through a conceptual literature review. From then on, I could identify if these pre-knowings were influencing me at any point. I also developed the skills of phenomenological interviewing through a separate, smaller research project that I used as a pilot for this study. I interviewed three students about their experiences of reflection through their lives. I discussed my interview technique with a colleague who is an expert in descriptive phenomenological method. She helped me understand the difference between interviewing with the phenomenological attitude and epoché, and an interview designed for a hermeneutic phenomenological study. I came to understand that the former should be an open and unstructured interview with follow up questions for clarity and qualification only asked in the descriptive phenomenological style. Examples of this are 'tell me more about...', 'describe an example when...', and 'what was it like for you to...'. This practice of the process was invaluable to me in recognising when I perhaps was, and was not, practicing the Husserlian reduction, and if my own assumptions and experiences were influencing my interview technique. I also tried to adopt epoché to scrutinise the data I obtained from my students about their lived experience of the essential meaning of the

phenomenon of learning and applying anatomy. In pursuit of this bracketing of knowledge, I interviewed myself about my experiences of learning and applying anatomy. I did this following a teaching seminar I attended for my own continued professional development on the musculoskeletal assessment and management of patients with sports injuries. I transcribed my interview and used it to acknowledge my own learning preference, my understanding of the subject, the learning of new practical application techniques, my reflections on the process of learning and applying anatomy, and the difficulties I had in learning new anatomy knowledge. This reflection helped me achieve greater consistency of approach in the research process, and a transparency in how my own involvement in the study may have influenced it. The write up of my work demonstrates the clear decision trail I used throughout the work, and the rigor with which I approached the study.

3.63 Scientific phenomenological structures

This is a question of generalisability. Can my structure of the phenomenon be applied to other areas of podiatric education, or more widely to healthcare in general? I have not presented the structure as ideographical and only having particularity with the students of my study. Conversely, I am not declaring the structure of the phenomenon of learning and applying anatomy as universal. However, I do wish others to share a familiarity with it, and that it resonate with them. Giorgi writes: 'So long as one can employ the eidetic reduction, with the help of imaginative variation, one can obtain an eidetic intuition into the state of affairs and describe an essential finding that is intrinsically general' (Giorgi, 2008 p.356). The structure of my phenomenon is an attempt to describe these meanings in a degree of depth and richness that others can identify with. For generalisability to be determined for the naturalistic account of everyday life, the context in which the data was obtained needs to be fully detailed (Mays and Pope, 1995, Todres, 2005). The reader must be given sufficient detail to determine what is transferrable to their practice, and what is not. This study has demonstrated that my findings are similar and different to other studies, and that they can contribute to the existing body of knowledge. My structure of the phenomenon is both plausible and coherent, and I hope it will resonate with colleagues who may see its significance and use it in their own practices.

3.64 Data analysis in the scientific descriptive phenomenological method

A meticulous approach was taken to data analysis. It took many hours dwelling with the data, to analyse it, to apply the eidetic and imaginative variation, and to rephrase the natural attitude lifeworld descriptions as phenomenologically and educationally expressed

meanings. The extraction of the characteristics of the constituent parts was performed in detail and through intuiting and imaginative variation. The process captured not only areas of agreement, but also areas of variation. As was discussed in section 3.41, descriptive phenomenology does not try to distinguish between the two, but embraces the variation (Hein and Austin, 2001).

Mays & Pope (1995) suggested that rigor of qualitative research requires the transparency of analytical procedures. That is, should another researcher analyse the same data, they would come to the same conclusions. Sandelowski argued that this was 'one of the most important threats to phenomenological validity' (Sandelowski, 1993 p.2). It is possible that should another researcher analyse my data, they could express it differently. However, I believe that having followed the scientific method of descriptive phenomenology as described by Giorgi, any other researcher would identify comparable content and the underlying meaning to be the same.

3.65 Communicating phenomenological research

A further assessment of the quality of this study is through the reporting of the results. The constituent parts were revealed through the descriptions given in the eleven interviews. It was a phenomenologically iterative process. Verbatim quotes which captured the lived experiences were used as evidence in presenting the findings. These were offered to assist the reader in appraising whether the final outcomes were true to the participants accounts (Slevin and Sines, 1999, Giorgi, 2009).

Comparison of the data analysed with the existing literature was not undertaken until after the discussion of the results. In this way, the phenomenon could be seen for how it appeared, purely in the data and was not influenced by the findings of other studies. The discussion gave an account of the phenomenon for all the participants, and the result was a complete account of the phenomenon. My work was not undertaken in isolation. Frequent discussions with my supervisors offered me educational and research challenge, and had me defending my understanding of phenomenology and its scientific quality. The doctoral student generally works alone. They are unlikely to have a team of researchers to work with them. Close collaboration with like-minded researchers may lead to the production of similar studies. However, this does not mean the doctoral student must work in isolation. In support of the supervisory process, and to develop me as a researcher, I became a member of two bodies of people. The first was a university phenomenology special interest group. Through them I have checked my understanding of the philosophy, argued for the descriptive than for

the interpretive paradigm, discussed reduction, member-checking and numbers of participants, and developed as a researcher. I have shared the progress of my work and have received constructive critical feedback. I have also contributed to the giving of feedback when listening to others present their work. The second was the Anatomical Society (Anatomical Society, 2016). I had not appreciated until that point that there were anatomy teachers throughout the world gathering to discuss pedagogic research and share anatomy classroom experiences for the enhancement of their own practices in teaching, and those of the student. They have inspired and encouraged me as I realised that I am a member of a much larger community of practice (Wenger, 1999).

The authenticity of this work will be judged by the reader. If my fellow anatomy teachers can identify with the phenomenon of learning and applying anatomy as presented, it may resonate with them, enabling them to see how it can be used in their own situation. If it has helped inform colleagues in the development of their own educational healthcare practice, then change for the better could be the outcome. If my study raises awareness that there is a phenomenon of the student experience of learning anatomy, and of their experiences when learning to use it in clinical practice, it may inform anatomy educators when developing resources, and improve the educational experience for the student.

3.7 Summary of the Methodology

Utilising human science research I focused on the lived experience of learning and applying anatomy. I conducted an educational enquiry using phenomenological philosophy as attributed to Husserl (Giorgi, 1985, Moran, 2002) and using a scientific descriptive phenomenological method as adapted by Giorgi (Giorgi, 1985, Giorgi, 1997, Giorgi, 2009). The aim of my research was to make known the phenomenon, its structure and constituent parts, within my professional context and through the production of clear and rich descriptions. In this way I could provide educators with the knowledge to “increase the power and control they have over their own actions” (Polkinghorne, 1988, p.10). It was not my intention for the outcome of the research to lead to comparisons of teaching strategies, measures of learner achievement, or cause and effect relationships, although these outcomes can all be achieved by qualitative research methods. My intention was to gain insight into students’ worlds to deepen my understanding of them and to widen my gaze of my teaching. I see this as a caring act (Van Manen, 2016). I have learnt more about students’ lives and my own, and I have paid close attention to my everyday practice of teaching anatomy. This research is evidence of my commitment to question deeply, think expansively, and concentrate exclusively on the concern of learning and applying anatomy. Through

phenomenology as a philosophy I have explored the ‘what-ness’ of the pedagogic experience. The scientific descriptive phenomenological methodology is congruent with education, and is therefore a suitable and appropriate choice for this study (Rose et al., 1995).

I was motivated to make the ways of learning and applying anatomy visible, so I used interview data to explore the descriptions of that experience. In asking students the meaning and significance they made of learning and applying anatomy, I was uncovering what that contributed to their becoming an effective clinician. Schostak (2005, p.175) discussed ‘interviewing’ in which he proposed the interview as having the potential to position participants as the authority in their own “ways of seeing”. The students’ own words have provided me with verification of my findings (Cousin, 2009).

At the conclusion of my research I have not claimed that the phenomenon of learning and teaching anatomy is a universal essence and will hold the truth for all people. Instead I have discovered a common structure that may resonate with others and with which they can have a shared familiarity. I have offered plausible insights for anatomy teachers in podiatry and for others in healthcare education.

3.8 Method

Having chosen scientific descriptive phenomenology as my methodology, I have turned to qualitative, phenomenological methods of data collection. Qualitative methods are good tools for capturing experience and researching phenomena by understanding the essential qualities of that experience through the voices of the informants (Moustakas, 1994). Phenomenological methods are a means by which people’s experiences and their reflections on those experiences can be captured to inform a better understanding of their meaning in the context of all human experience (Van Manen, 2016), usually through protocol writing or interviews, and occasionally through close observation (Giorgi, 2009, Englander, 2012).

3.81 Method summary

Three mature, Caucasian students with a previous first degree took part in this research: Susie, Janice and Richard. They were first interviewed in year one. They were then interviewed twice in the second semester of year three, following specific clinical encounters. Two of the three students then voluntarily revisited the dissection room for an extra anatomy learning session and they were subsequently interviewed for a fourth time. The interviews were recorded, transcribed, and analysed using the Giorgi method of

scientific descriptive phenomenological analysis, the detail of which can be found in section 3.5.

Pseudonym	Interview One:	Interview Two	Interview Three	Interview Four
Susie	April year 1	February year 3 (general clinic)	March year 3 (MSK clinic)	
Janice	April year 1	February year 3 (MSK clinic)	March year 3 (general clinic)	May year 3
Richard	April year 1	March year 3 (general clinic)	April year 3 (MSK clinic)	May year 3

Figure 3.1. Interview schedule

3.82 Ethical Approval

Ethical approval was obtained from the University of Brighton, School of Education (see appendix 2). Ethics is the study of doing right and of morality in existence (Baggini, 2007), and research must be carried out ethically and respectfully (Briggs et al., 2012) so that the students can be safe, build trust and the outcomes of their labour should be of benefit to others. It was my responsibility to design and conduct my research in an ethical and value-based manner.

3.83 Recruiting Students and ethical considerations

I required a sample of students who had experienced the phenomenon and could therefore describe to me what it was like for them to learn and apply anatomy in practice. My target recruits were therefore those students in year one who had experienced and completed the first semester 20 credit module in anatomy and who could describe their learning of anatomy in the class- and dissection room. I then needed to interview the same students in year three to again capture the descriptions of their experiences, but this time of applying that anatomy knowledge in practice after two particular clinical sessions.

I needed the students to volunteer freely and without coercion. For this, I sent an email to all year one students and waited for responses (appendix 3a). The issue for me here is that I was essentially in- and had authority over them due to my positions as anatomy module co-ordinator and main educator, and their course leader. I was at pains to reduce this inequity in our relationship. To minimise any bias against or favour towards any student who agreed

to participate, I promised that I would not take part in any subsequent marking, second marking or moderation of their assessments in year one or year three and would not be an examiner in their end-of-year clinical examinations. Five students came forward.

Students need to know why the research is to be done, so they can decide freely whether they want to be a part of it; how it will be conducted, so they are comfortable with what is being asked of them; and what will happen to the information they give, so they understand the value of the research and who the consumers will be. For this, I wrote an information sheet (see appendix 4a) and explained it verbally prior to the interview. I also reassured each participating student that they were free to withdraw at any stage. I checked that they understood the process of the interview and research, and that they were happy to continue. They then signed a consent form (appendix 5a). Of the appointments scheduled, four students attended their interview and the fifth withdrew prior to the allocated date due to ill health.

Two years later, the students were in year three. Unfortunately, one of the original four students had transferred to another university and I was unable to interview him again. I sent the three remaining students an email (appendix 3b) and the information sheet (appendix 4b), once more inviting them to take part in my study. All three agreed and consented (appendix 5b).

Research terminology usually requires a person who participates in a study to be named a subject or a participant, which suggests that they are representative of a particular group. In phenomenology, the person providing their descriptions are unique, incomparable and unclassifiable so it is not always considered necessary to depersonalize them (Giorgi, 2009). In this study, I identified the students in the data transcription by pseudonyms they each chose at their first interview. From the data analysis stage to the end of the thesis, I changed the pseudonyms again to ones even the students of the study have not been a party to.

3.84 Data Collection

Interviews produce a narrative (Creswell, 2012), and in this research it allowed the students to voice their experiences of learning and applying anatomy and organize that awareness into meaningful episodes (Polkinghorne, 1988, Kvale, 2006). Phenomenological interviews treat the issue of learning and applying anatomy not as a problem, but as a question to be enquired about to discover the meaning of the phenomenon (Englander, 2012). My orientation to the interview was always to ask about the nature of the phenomenon through their lived experience.

The loosely semi-structured interview was my method of choice, fully supported by the phenomenology literature (Benner, 1994, Moustakas, 1994, Giorgi, 2009, Englander, 2012, Creswell, 2012). It permits time for the participant to tell the stories they wish to be heard through rich description of their concrete experiences, but not be steered by the interviewer to areas they did not wish to discuss. For the interviewer, the phenomenological reduction is to firstly practice epoché, and reflect on their pre-knowns, assumptions and partialities so that these may be laid aside. They should take on the phenomenological attitude, and shift between paying attention to the participant describing their experiences and the phenomenon of the study as it appeared to them. In my case this was of learning and applying anatomy. Englander (2012) argues that the phenomenon is more important than the person being interviewed (Englander, 2012).

The first interview took place mid-way through semester two after the anatomy module had been successfully completed. A few days prior, I sent the volunteers details about the study and the research question to give them time to reflect on their experiences before I would be asking them for descriptions. This was a form of pre-meeting and is an acceptable method in phenomenology (Englander, 2012). The second and third interviews in year three were scheduled in semester six, just a few months before their course would be completed. We agreed mutually convenient dates and times, one for the day following a general clinical session and the other for the day following a specialised musculoskeletal clinic. These occurred in either order. Both dates had been set in advance and the students knew they would be describing their experiences of these identified clinics. I interviewed two of the three students once more, just prior to completion of the course and the day following a final experience in the dissection room where they engaged with learning through prosected cadavers with both the full torso and lower limb dissected. Again, they were aware of the purpose of the interview. The third student did not participate in this dissection session. In all, I had interview transcripts for eleven interviews: three post-teaching year one interviews, six post-clinical session year three interviews, and two post dissection interviews. This amounted to around seventy eight pages of transcript.

With their permission, I observed and video recorded all three students in the general and specialised musculoskeletal clinical sessions prior to their second and third interviews scheduled for the following day. This was to gather a clear picture of the student in the clinical environment, to be sensitive to their descriptions, and to be able to relate what they would say with the real events. I sat in the corner of the cubicle or room, partially obscured from view behind the patient couch and was able to watch their interactions with the patients,

their tutors, and with each other. It gave me a window on the clinical session unique to that situation. There is one paper on phenomenological methodology for nursing research that referred to using observation in data collection (Oiler, 1982), and one phenomenological study that used observation of nurse teacher practice to enhance their interview data (Green, 1995). The study by Green (1995) looked into the meaning attributed to the phenomenon of experiential learning by a nurse teacher when conducting teaching sessions with her students. Green does not elaborate on how she used the observation data but does suggest that, having adopted the phenomenological reduction, it contributed to the lessening of her partiality when analysing the interview transcripts (1995). Green also discussed whether she should have video recorded her participant and felt that it may have allowed her to scrutinise the less explicit meanings of the experience not captured at interview, but rejected the idea for fear the recorder may have been too intrusive in the classroom setting and changed the behaviour of people in the room (1995). I re-watched one video recording just prior to one interview, however I soon realised that this was not in keeping with the phenomenological philosophy. Participants should describe their experience as it appeared to them, and not as it appeared to me. I therefore did not revisit any of the other five video recordings. I did, however, make short notes at the time of observation and occasionally used these notes to guide me in the interview to ask about the student's experience at various points of the clinical activity. I found the observation of these clinics very helpful to understand the context of their description at interview having observed their human interactions, their general skills of podiatry, their specific skills of anatomy assessment application, and each student's demeanour. However, I only drew on this material once I had analysed and presented my findings and written my discussion. It was at this point that I unveiled my pre-understandings known about the phenomenon by lowering the educational phenomenological attitude, and situated my findings with those of the literature.

In preparation for the year one interview, and in order to ensure I was focussing on the phenomenon (Englander, 2012), I selected a couple of primary questions designed to guide the student into describing their experience of learning anatomy in the classroom:

Can you describe for me, when you were in the classroom/dissection room, your experience of that occurrence that helped you learn?

and

Can you give me a specific example that captures for you the way you experienced learning anatomy?

In preparation for their year three interviews following the clinics, I selected the following to elicit their descriptions of how they used that anatomy in the clinical practice:

You had a session yesterday where you worked in the (musculoskeletal/general) clinic and I observed you. What was your experience of the clinic?

and

Through your experiences, what is your understanding of anatomy that underpins your decision making? OR Can you talk me through your experience of doing (something I saw) and how it relates to anatomy?

From their descriptions, I asked them further questions that were of interest to my phenomenon. These questions were to expand a description, or encourage another description from the first. Examples of my secondary questioning technique was “Describe what it was like for you”, “What was your experience of....” and “Give me an example of”. By asking questions in these ways, I was enabling the students to choose the instances of experience they wished to describe, give as full an account as they could, and offer me description of their concrete experiences as they lived through anatomy education and its applied practice.

Each interview lasted between 45 and 60 minutes and around 78 pages of transcript were produced. I labelled each of these transcripts with the student’s pseudonym, and a number according to the particular interview session. For example, Richard’s transcripts are titled:

R₁ Year one interview

R₂ Interview after the general clinical session

R₃ Interview after the specialised musculoskeletal clinical session

R₄ Interview after the final dissection/prosection session

The three students who remained in the research to the end were all on the undergraduate podiatry degree, Caucasian, of a similar age, two females and one male. A more lengthy biography of each student can be found in appendix 1, but this is a brief summary of each. Janice had a first degree in psychology and sociology and had worked for twenty one years in social work settings. As an addition she had successfully achieved level three courses in anatomy and physiology, massage therapy and reflexology but wanted more out of her education and to have a greater clinical focus. She therefore decided to study podiatry. Richard studied Law and took the bar when he was in his early twenties, specializing in banking and tax law for the next twenty or so years. He had always wanted to work in healthcare but parental objections had prevented from doing so. When the opportunity presented, he left the legal profession and enrolled onto the podiatry course. Susie was, and

still is, a nurse of eighteen years. Her nurse training was in the days of Project 2000⁴ and she claims it was practical and non-academic. She had worked as a chiropodist in the past, but the training was basic and not accepted as sufficient for work in the NHS. Susie considered the podiatry course was a return to her first career choice, and wanted to tie her nursing specialty and podiatry care together.

The commonality of these students' was that they were all experiencing the phenomenon of learning and applying anatomy, and this made them a purposive, homogenous sample. While they share certain characteristics, my study has examined the differences in their approach to anatomy as a discipline, their attitudes and values towards developing anatomy learning in practice, and the diversity of the application of their anatomy learning in the clinical context.

⁴ This was a new system of nurse education introduced in the early 1990s which moved the training of nurses out of hospitals and into universities.

4.0 FINDINGS

This chapter explains the process of analysis of the data collected, and the resultant structure of the phenomenon. I then present a comprehensive description of the three podiatry students' meaningful lived experience of learning and applying anatomy as they have progressed through the podiatry degree course.

Through the Husserlian philosophical principle of phenomenological reduction, and Amedeo Giorgi's robust, methodical, scientific approach (1985, 2009), I took an educational perspective to descriptive phenomenology (Giorgi 2009). I assumed an educational phenomenological attitude to see the phenomenon as it appeared to the students, and attempted to set aside my pre-knowings about learning and applying anatomy. Through eidetic intuition, I analysed the data to reveal the educational perspective of each lifeworld description, with the phenomenon of learning and applying anatomy as the focus. Using free imaginative variation, I reduced the phenomenon to its characteristic parts. This strict adherence to the process of data analysis strengthens my generalised claim for the educationally expressed meaning of the phenomenon under study (Todres 2005, Giorgi 2006).

This study was a scientific descriptive phenomenological study with a scrutiny of the findings to reveal a deeper understanding into the lived experience of students in learning and applying anatomy in clinical practice. The methodology was not of the hermeneutic paradigm whereby there is a requirement to interpret the findings (see section 3.42 for a discussion around descriptive and hermeneutic phenomenology). However, inevitably there is some element of interpretation. The interpretation I have employed is a literal one, used in an attempt to re-express the meaning units from the natural attitude into a description from the perspective of education and with the phenomenon in mind, and to bring to the fore those findings I deemed important to present and discuss. However, this is not interpretation in the theoretical sense, as would be demanded by other phenomenological and qualitative research methodologies. Should others scrutinise my data, it is likely they would express the students' meaning units in multiple other ways but would probably communicate a similar structure as I have. As Giorgi (2009) points out, it is the meaning these students make of their experiences that matters, not the manner in which others choose to articulate them.

The resultant structure is a synthesis of eight constituent parts, the assembly of which makes up the phenomenon of learning and applying anatomy. Each constituent part is reliant and connected to each of the other constituent parts, and if it were to be removed through the process of imaginative variation then the structure would not remain intact. These findings

are based on three students and their transcripts of up to four interviews each, conducted over a two year period.

4.1 Analysis

I took an approach to descriptive phenomenological research aligned to Husserlian principles, but using a robust scientific method adapted from Giorgi (2009) (see section 3.5). Giorgi's method is centred on finding the characteristics of the phenomenon through a scientific phenomenological reduction and epoché (see section 3.33 for an explanation) (Giorgi, 2009), whereas I took the disciplinary attitude of education ((Van Manen, 2016). Giorgi's analysis is in six stages (1985, 2009). I have used these six stages and expanded them to eight to increase rigour in the treatment of the data and a justified confidence in the resultant structure. What follows is a detailed description of the process of my analysis.

1. Before starting the analysis, I assumed the phenomenological reduction. I did this in two ways: (a) the adoption of the educational phenomenological attitude to see the phenomenon only as it appeared to the students, and (b) epoché; the bracketing out of all my presuppositions, assumptions, beliefs and theories pre-known about the phenomenon, which is to acknowledge my own lifeworld of the phenomenon but not to engage that knowledge.
2. I listened to and read through the transcripts multiple times. This was to get the overall impression of the data. Learning and applying anatomy does not happen in isolation: it manifests through the context of the whole experience. It is therefore an inherent part of the process to be familiar as much with what is described later, as with what is being described at that moment. Equally it is important to see the data as having forward and backward references.
3. I then divided the data into meaning units. By being sensitive to what appeared in the students' consciousness, their description could be sectioned. Every time I sensed a transition in meaning, I separated the script into parts by placing a break (/). For an example of this, please see appendix 6. These breaks were established through my own intuition, but meaning units are not absolute so should one be too short, or too long, this would be discovered and corrected at the next stage of the process. It could either be left with less of or a more expansive translation, or changed by adding it to an adjacent meaning unit, or broken into smaller meaning units.
4. The next step was an examination of the natural attitude as described in each meaning unit, re-expressed to reveal the perspective of education in the description. I kept the phenomenon of learning and applying anatomy as the focus, and practiced eidetic

intuition to see all the ways in which the data could be understood and to imagine the appearance of the phenomenon in a variety of contexts. I was uncovering students' 'appearing' of the phenomenon under scrutiny and was mindful not to digress into other areas of meaning or understanding (Giorgi, 2009). Some meaning units took me many attempts to get the right expression, and more than one step to reach the best expression of that transformation. In so doing, I was looking for the expression that was more disciplinarily revealing and more generalised. To accomplish this I sought the characteristic of the phenomenon as captured through the narrative (Van Manen, 1991, Giorgi, 2009, Vuoskoski, 2014).

5. I reduced all of the meaning units for each student at each interview into their most general educationally explicit meaning, to determine the whole textural description of the experience for that student.
6. Again, through eidetic reduction, I assessed similarity and difference of these individual explicit meanings with those of the other two students at each of their interviews, to determine the expressions of the lived experience common to all three students.
7. Next, I verified the data through checking and re-checking the analysis using free imaginative variation. This is an intuitive process whereby I removed each expression in turn to see if the structure would hold up, or collapse, without it. Once verified as essential, I classed the expression as a constituent part of the structure of the phenomenon.
8. I then synthesised the constituent parts into a single structure. The structure relates to how students express their meaningful lived experience of the phenomenon of learning and applying anatomy.

Figure 4.1 below is an example of the stages 3 and 4 above, to show how the students' description can be divided into meaning units, and a translation made which reveals the educational perspective of the lived experience. It also demonstrates how this can be a single process or a multiple one, particularly when the desired fulfilment of the translation was richer, in phenomenological terms. This approach was applied to every interview transcript.

<p>Narrative in the ‘natural attitude’ from the interview, as meaning units</p>	<p>The meaning unit reframed, keeping in mind the phenomenon of learning and applying anatomy and taking the perspective of education</p>	<p>Further phenomenological analysis of each meaning unit</p>
<p>I don't think I could help myself. I have to learn everything. I am not a person who learns... I can't just know a little bit and know it. I have to know the whole picture to be able to know it, and recall it, and use it.</p> <p>That's... I think I realised that quite a long time ago, that I do need it. It's quite a hard way of going around learning things, but then I find it's more thorough, for myself.</p>	<p>Janice feels it is a compulsion, that she learns anatomy in her own time. She feels dissatisfied with not having a full anatomy picture to work with. In this way she can be confident in her knowledge, her ability to recall and her skill at applying understanding of anatomy to practice. She recognises this as a characteristic of herself. She says it is hard to do but finds it deeply satisfying.</p>	<p>Janice is motivated to understand the anatomical whole, as well as the structural parts. She experiences this as a compulsion. She describes it as a personality trait, and is deeply satisfied by her success of achieving it. She is deeply committed to learning anatomy for its effective application.</p>
<p><i>(her lecturer)</i> getting us to perform the tests...that was good. Because you can watch something, but learning...I have to do it as well. Because that... that imprints.... and I get a feel for it. I think I do learn by I can learn by observing but until I actually do it, I don't feel I learn as well. Definitely not. Um, and that to have</p>	<p>Janice was asked to actually perform the MSK tests on the patients, not just observe her lecturer do them. Janice can learn by watching, but she learns better by experiencing it; it helps her get a feel for the test and secures it in her brain. And to speak about what she is finding, and say it all out loud, is very different for her that just thinking it.</p>	<p>Janice experiences learning to apply anatomical function through experiencing and verbalising, which is very different for her than observing and thinking. Janice is self-aware and reflective in her approach to applying anatomy.</p>

<p>to say things, talk things through, um, I can know it in here... but getting it to come out of here....it's very different</p>		
<p>Nerves! Nerves are fascinating because they obviously do so many different things but to actually see them, physically, because you know they're.... well, electrochemical, but to actually see the physical structure. So you can actually see it. It's a bit like a ... I suppose, scientific, isn't it, it's very ... that connects to that axon, that axon connects to that axon.</p>	<p>For Janice, observing the nerves through prosection is an emotional experience using her senses. She describes it as 'seeing' science and how it manifests in the human body. This excites and fascinates her.</p>	

Figure 4.1. An example of phenomenological analysis

An example of how the natural attitude meaning units as described in the narratives were reframed with the phenomenon of learning and applying anatomy, and with the perspective of education, in mind. Then a phenomenological analysis offered where the transition from the natural to the phenomenological attitude was particularly phenomenologically rich.

4.2 The Structure

The following is the structure of the meaningful lived experience of learning and applying anatomy for three podiatry students on a degree programme in the context of higher education:

For the student, the experience of learning and applying anatomy begins with assuming a learner-ready attitude. Through this readiness to learn and an understanding of their learning preferences, the student employs a pattern of behaviour designed to facilitate the effective and efficient application of that learning of anatomy into clinical practice. To understand

anatomy and make meaning of its use, the student constructs it to make a whole, or deconstructs it to see the parts, always with the need to ground anatomy in relevance and maintaining a sense of reality for or from practice. Through communication with the patient and with an underpinning knowledge, the student uses anatomy to solve clinical problems and bring about diagnosis and management. This is achieved more or less successfully working alone, with resources, and through and with others. To measure success or not, the student recognises (in)competence in self and others. The totality of the experience of learning and applying anatomy is mediated by the student reflecting and acting on that reflection to enhance subsequent experiences.

4.3 Constituent Parts of the Phenomenon, as Described

The eight constituent parts of the structure of the meaningful lived experience of students' learning and applying anatomy are: 1) assuming a learner-ready attitude, 2) employing patterns of behaviour, 3) (de)constructing anatomy, 4) a sense of reality for or from practice, 5) solving clinical problems, 6) working alone, with resources, and through and with others, 7) recognising (in)competence in self and others, and 8) reflecting and acting on experience.

Figure 4.2 demonstrates through diagrammatic representation the role the constituent parts play in the structure of the lived experience of learning and applying anatomy. Each essential element revealed a relationship with each of the others to comprise the phenomenon. Assuming a learner-ready attitude was experienced as the initial element which would feed forward to the others. Employing patterns of behaviour characterised the students' approach to learning and applying that learning in applied contexts, also featured at the start. The next two parts, (de)constructing anatomy, and a sense of reality for or from practice, were about learning anatomy as a subject, gathering knowledge and beginning to understand its use in practice. Solving clinical problems, and working alone, with resources, and through and with others, were focused on using anatomy in practice and deepening knowledge and understanding for effective care. These four constituents were very closely aligned and frequently interconnected. Recognising (in)competence in self and others was an introspective pursuit and could occur during or after experience. Reflecting and acting on experience was ubiquitous. It appeared everywhere and spoke to every constituent. The diagram therefore shows it as a presence that permeated throughout.

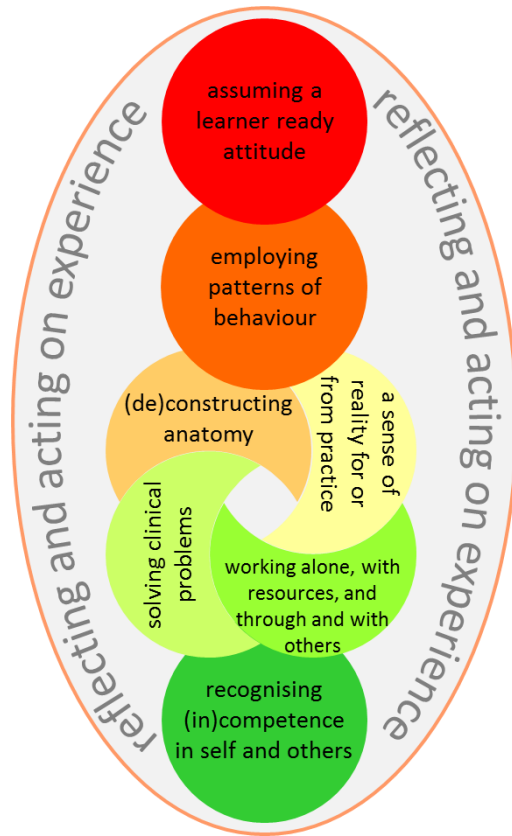


Figure 4.2. A diagrammatic representation of the role of the constituent parts (Original in Colour)

What follows is a comprehensive presentation of the descriptions of the meaningful lived experience of the students using the Giorgi method of descriptive phenomenology (1985, 2009). It is an in depth examination of the students' natural attitude, and the appearing of the phenomenon in their lifeworld. Each constituent part is presented as a demonstration of how the individual students expressed their meaningful lived experience of learning and applying anatomy. To show rigor in the analysis, I will illustrate the constituent part by revealing the students' own descriptions to act as a window into their lifeworld. To do this, their narrative (*in italics*) will be inserted at appropriate moments either as single words, short sentences, or full and rich description of particular examples. An annotation of which student and which interview (e.g. R₁, S₂, J₃ etc) will also be made beside the quote. I shall also elucidate how the constituent parts of the phenomenon are inextricably linked to each other.

4.31 Assuming a learner-ready attitude

Being learner ready is a constituent that intersects with every other constituent part. All three students described their motivation to learn which was grounded in how challenging they experienced the discipline. Janice and Richard loved anatomy and described coming to understand and use it comfortably in practice. For Richard, anatomy permitted him to

employ all his tried and tested strategies of memorising and recall: acronyms, analogies and repetition for reinforcement. Janice described anatomy as *scientific* and has a fascination with anatomy that totally immersed her in its world: *I get lost in it, seeing how it all webs together* (J₁). She used every moment she could ensuring she understood anatomy in both morbid structure and applied function, and the detail of pathology as it applies to that structure. Conversely, Susie was immensely challenged by the subject and found it a constant *struggle*. She watched those around her excel at anatomy and it demotivated her, leaving her feeling *useless* and *shut off*. To overcome this feeling of ineptitude she focussed on what she did know and understand, and the environment in which she felt most comfortable: *I love clinic. It's where I feel happy...happier, happiest* (S₂). Susie claimed clinic as her natural environment, where she could experience the hands-on caring for real patients rather than the abstract study of reading texts. She described clinical practice as being *put to use* (S₂) and was motivated to enhance her learning through clinic. This relates strongly to the sense of reality for and from practice, a constituent which will be presented and discussed later.

All students described their way of learning: procedural and methodical for Richard, practical and problem based for Susie, and concrete and analytical for Janice: *I love building it up and then breaking it all down* (J₁). Indeed this was so ingrained in the behaviour of Susie and Richard that if they were not afforded the opportunity to work in this way, they would experience a *break down* or *panic* and their brain would empty of all rational response. Even Janice described having a *mental block* when being challenged to her limit. For Richard, using anatomical language and applying his musculoskeletal assessment skills in practice was comfortable, but only if he was permitted the responsibility and space and to operate his initial assessment and presentation to the tutor autonomously.

Richard described how he built his application of anatomy by piecing a puzzle together; a problem solving exercise. He was using his past and existing knowledge to formulate new understandings and make sense of the complex situation in front of him. Sometimes his tutor was needed to put in the final pieces:

Richard₃: *I think what facilitates anatomy learning for me is that when you have an event which may be something that you're very familiar with... it could be quite a simple thing... you think 'well what's unusual there?', but the patient happens to be diabetic, or they have a pathology which interferes with their gait or their locomotion... And so therefore you have these pathologies that are interacting, that are referencing all previous learning..., but there are also new things that are prompting.... 'well that piece of knowledge is fine as far as it goes, but there's not*

enough material there to make a new solution'. How can you develop that in order to provide solution? And you're aware you know an amount, which is helping you, you hear a tutor pouring like a font of wisdom, or new resources, and you're trying to take from that, listen and remember, while you are applying it at the time.

Susie also liked puzzles and was motivated to learn through them:

Susie₂: You know the models that you have, with the legs, with the muscles, that you sort of slot the muscles in, I like those cos it's like a puzzle and you have to work it out. What goes where, so I like that. So working out what does what, and yeh. I like that...

For Janice, the motivation to understand the whole as well as the parts, the constituent part (de)construction of anatomy, was a compulsion. She described it as a personality trait, and was deeply satisfied by her success of achieving it.

Janice₂: I don't think I could help myself. I have to learn everything. I am not a person who learns... I can't just know a little bit and know it. I have to know the whole picture to be able to know it, and recall it, and use it. That's.... I think I realised that quite a long time ago, that I do need it. It's quite a hard way of going around learning things, but then I find it's more thorough, for myself.

Richard also liked to deconstruct anatomy, describing the body as a *feat of engineering*, or an *orchestra* (R₁) which operates its individual anatomical parts to create efficient movement. All students described their love of learning and how they prepared for lectures, practise sessions and clinic alike. Susie thrived on repetition, an understanding of relevance to clinical situations and being challenged by her tutors, and had very high expectations of herself. However, she was constantly aware that she was not measuring up to her own standards. For Susie, this was very hard to bear; she is an accomplished clinician and respected professional in her role as a nurse, but her low self-esteem with anatomical terminology created vulnerability in her and a barrier to her optimal competence in podiatry. More will be discussed about this later, as it relates both to her adopted pattern of behaviour and the ways in which she solved clinic problems.

A sense of responsibility also showed itself as a motivating factor in learning and applying anatomy. Susie was conscious about always doing the best for her patient, having *concern* for them and not to *cause any harm* (S₂). For Janice, a sense of responsibility manifested itself as her desire to know that she can use anatomy in practice effectively. Richard was driven by his integrity: *I think patients' confidence and trust is hugely important*, and when he was exposed as having shortfalls he was undermined and diminished: *you feel a bit poor*

for their sake, and also your own (R₂). He wanted to appear that you've done some work; you're prepared; you're in a state now that you can fairly efficiently and effectively manage their problems (R₂). For all three, there was a sense of commitment to the patient, and this came out in a particular pattern of behaviour.

4.32 Employing patterns of behaviour

As it did for being learner ready, the patterns and processes by which all three students approached learning and applying anatomy to real patient situations stemmed from how they viewed the discipline. Janice described her use of anatomy in these terms: *I'm always confident to be able to approach anatomy knowledge and to try to make sense of things... I find it very useful and just like a friend (J₁). She described the cadaver as a friend too: *It's like getting to know a person (J₄). She was not scared of anatomy, indeed she was struck by the reality of the structures and their ultimate power to bring about movement. Richard was also comfortable with his anatomy knowledge, and was not afraid to tackle patients with complex biomechanical conditions. But for Susie, learning anatomy had not been a linear experience. Even by year three, Susie was highly uncomfortable with the language of anatomy and this hindered her ability to communicate her application of it in practice. The issue for Susie was that her pattern of behaviour was to see the application of anatomy in clinical practice as a reverse experience: *If I see something, I'm better at working backwards (S₂). She described looking at the consequences of the condition and how that might be prevented: *So my way of learning is seeing a situation, I'll think about the bigger picture... and I'll look ahead (S₂). She would then be able to consider that patient anatomy by relating it back to the classroom. This is a problem based approach to clinical problem solving.****

All three students described their pattern of working with patients as logical, methodical and rehearsed. Janice described herself as an analytical and conceptual thinker but who liked to apply new knowledge in a practical way very soon after the theoretical learning had taken place. She gave many examples in which this happened; from learning new knowledge in a lecture, to being shown and practicing a new assessment skill and applying these new experiences to patients, hours or days later. She also described instances where the application did not happen in such a timely way which left her feeling *ill equipped* and a little panicky. Richard was a reflective learner who took action to improve and develop:

Richard₃: when you... use it reflectively, that reflection links in to what you've learnt before, so calls up that menu of things you can think about or apply in order to solve or help the problem in hand.

His pattern of learning and applying anatomy was strictly methodical: *when it gets to the stage of seeing a new patient, you approach it in a methodical way,then it's going to be a more comprehensive and a more reliable method (R₂)*. What confounded him was having his method interrupted. This happened through the interjection of verbal challenge by tutors, and by their occasional use of metaphors with which he was unfamiliar. For instance, the reference to a muscle in the knee used extensively in football “*What is the kicking muscle?*” (R₃).

Janice enjoyed the responsibility of patient care but recognised that her knowledge must not be restricted by the scope of podiatric practice alone, and that the foot is a part of the much larger whole. She therefore described her knowledge of the thigh and of the spine, and at times the brain and the bladder, and how she had applied the same behaviour of getting engrossed in anatomy learning of those parts, and having to pull herself out of the space to study other subjects. Not so for Susie; she found classroom learning lacked relevance for her, and the tools used to apply anatomy such as clinical forms and biomechanical theories, perplexing.

For Susie, learning and applying anatomy was predominantly about talking with the patient, assessing their needs, identifying troublesome areas then relating them back to the anatomical structures:

Susie₂: I always believe there is a cause and I feel you need to find a cause. So that's almost like a puzzle, isn't it. You've got to find out why. ...I need to know why so I find it easier to question history taking, and go backwards. What's happened, what's led to this, what conditions have they got, you know....rather than trying... look at something, and academically work it out without all of that.

She was a person with whom the burden of responsibility of optimal care weighed heavily and therefore she was motivated to learn and apply as much anatomy as would render her a safe practitioner. Richard, on the other hand, read and recalled structures, worked out and understood function, visualised through dissection, consulted theory, imagined the anatomy of the limb through the skin of the patient, and had an appreciation of the malfunction of the parts. This was a thorough, systematic approach adopted throughout the three year course.

The key for all three students in the application of learned anatomy to practice was their developed behaviours in clinic. For Janice, applying anatomy was a constant act of revision and reinforcement, of making connections, and of maintaining her level of confidence: *It's having the confidence that you can use your own experience to apply to a situation (J₂)*. She made connections between past knowledge, present understandings, and future practice by

grounding it in personal relevance and experience. Richard prided himself on never taking anything for granted, revisiting assessment and diagnosis every patient visit, and having the confidence to agree with or disprove others' assessment findings. He never shied away from complex problems and *ran through my own little model* (R₂). Susie learned by experiencing, both through positive and critical incidents, and these concrete experiences were lived as sudden moments of clarity:

Susie₂: so once I had found or discovered that, I could then work back and everything slotted into place. That will stick with me forever now, because I visualised what he was saying.... And then once he said it, that penny dropped.

These patterns of behaviour manifested throughout the descriptions given by the students numerous times and in a variety ways. What then strengthened their behaviours were the way they treated anatomy; by seeing it as a whole, or by breaking it down into its parts.

4.33 (De)constructing anatomy

Anatomy, for these three students, was tackled either by breaking it down into its structural parts and building it back up, or by seeing the body as a whole and focussing only on those parts that are necessary for effective practice. For Janice and Richard, learning anatomy involved an understanding of the anatomical parts in their intricate detail and how they might appear in reality: *actually seeing it (the Iliotibial band) in real life, I didn't know it was that wide* (Janice₁), *...the sciatic nerve, you expect to see something substantial because it's a very, very big nerve, but you don't expect to see 'British Telecom' cable* (Richard₄). Janice liked to understand the terminology of anatomy; the Latin or the Greek and the origin of those names, and imagined how structures might appear in the body: *breaking it down to anatomy... it would have been very interesting to have seen an X-ray of the joints... at which point the curve started* (J₂). Richard also saw anatomy in this way:

Richard₁: the more you do and are exposed to anatomy, the muscles, their actions, seeing them in three dimensions, do you begin to realise what a vast sea of wonder you are dealing with, and the learning begins to take on a new format.

For both Janice and Richard, fascination and wonder were expressed at the complexities and actualities of the individual structural parts. But for Susie, anatomy was about cramming her head full of anatomical facts and terms and struggling at every turn: *I learnt parrot fashion and it didn't come naturally* (S₂).

Susie's challenge with anatomy continued into understanding its function, where she would get herself *so muddled up over those simple terminologies* (S₂) because she could not relate

to the part or visualise it in action. It held little meaning or relevance for her. Richard expressed it another way: *if you don't know it (the detailed part) you cannot hope to try and describe what it is or its function (R₁)*, and for Janice it was about having *some sort of meaning....so it's got a place in my life (J₁)*. This aspect of learning and applying anatomy, of making meaning and having a place in one's life, is the next constituent part to be presented through 'a sense of reality for or from practice' (section 4.34).

Relating it back to the constituent part of patterns of behaviour, for these students constructing or deconstructing anatomy was about the subject being conceptualised from the theory to the practice, or vice versa. For Richard and Janice it was the former. The cadaver held a particular meaning for Richard to permit him the rare insight into real form and its construct, and how that builds the intricate 'orchestra' of an efficient human body. Reflecting on his experiences, Richard had spent this course building on his early knowledge of structure and function, considering the theories of movement, seeing the reality of a cadaver, and working with patients to assess, diagnose and manage their condition:

Richard₂: the theory's built up from looking at what is represented in the book, and you have to start somewhere. And it may be a picture, or may be a little more artificial. But then when you begin to work with people, you begin to listen to their description of parts of the anatomy that are causing the difficulty, you become more, and more, and more familiar. So you may look at a cadaver and look at the structure and be very aux fait when, say it looks dark reddy brown, slight silvery inflexions at the sides, that doesn't do much for you except give you a very clear three dimensional picture as to what that looks like. But when it starts to play up or it malfunctions in the body, reports of the discomfort or the type of sensation the patient's feeling, gradually builds you a database on how that structure is not functioning to its maximum, or what is described as its normal but it's causing them discomfort. And all of that data goes to build your databanks in your head as to what you feel, what you hear, what you understand by it, how you can appreciate that, and then what you might be able to do about it in terms of treatment or interventions.

The reality of dissecting a real person had not passed Richard by, however. He struggled with the sensitivity of dissection and the inability to separate his feelings that the cadaver was a human being: *it hits me quite strongly that way. I sometimes find myself looking at some structure, and then I glance up towards the head thinking gosh, this is a person (R₄)*.

Janice was also constantly reminded of her past understandings of anatomy through her previous profession and, together with her newer experiences of learning in the anatomy

classroom and particularly the dissection room, she was able to picture the structure in both normal and abnormal state. Her description of tendons, and particularly the calcaneal (Achilles) tendon, demonstrates this very well:

Janice₂: *I did like to look at origins and insertion points. I think that came from when I did massage (therapy), that I would need to know the insertion points and thinking about tendons and collagen..... I think tendons are amazing because they bring in the whole of human movement, and the fact that they store energy so they don't need energy! I think I'd like to have more experience with degenerative tendons. Like I say, I would like to see under a microscope and get right down to the different collagen fibrils. I'd find that fascinating....I looked quite a lot up last year about Achilles tendon, and mid portion, and then insertional Achilles tendinopathy. So I find it quite important that it could be a completely different condition depending on what part of the tendon is (damaged)*

Susie's method of learning anatomy was different. She was able to determine the consequence of pathology and picture the underlying anatomy, but it had to be in that way and without the use of terminology. Failure to experience the application of anatomy on these footings brought on a sense of *panic* and a mind freeze. Unlike Richard and Janice, Susie did not like dissection and wished it had been optional. She found the room distracting, busy, smelling of embalming fluid, and she lacked focus. She did describe her appreciation of it as a one off occasion *to actually see how intricate and involved everything is* (S₁) but preferred learning methods such as models and hands-on practise. For Susie though, anatomy and its application had been made into something complex and challenging, whereas she saw it as *a lot simpler than we make it out and if the end result is the same, does it matter?* (S₂). This had the outcome of Susie feeling and appearing as a novice clinician which actually belied her accomplished practice.

As mentioned before, Susie was a problem solver and worked from the pathology to the anatomy. For her, anatomy and its application was a puzzle to be solved, logically and methodically, but starting with the patient as the whole and working back to the structure, or the part. Janice worked the other way around, building a scaffold of knowledge from the detail of morbid structure, to the application of complex musculoskeletal assessment. She was aware of her *analytical* approach and described it many times. Janice also liked that she must understand the anatomy of the entire limb, not merely the foot, to provide the most comprehensive care for her patients. And for Richard, it was a seamless process of retrieving

detail from his *databank* (his brain) using meaningful triggers to produce appropriate outcomes:

Richard₂: *like a tiny filing cabinet, and the more you do, and the more you say, read and think, it doesn't appear that it sticks. But if something's mentioned, there is something deep down that recognises. How one would describe accurately what that deep but faint recollection is, but if you poke it enough it seems to come up to the surface.*

4.34 A sense of reality for or from practice

All of the students, in multiple ways, expressed their need for anatomy to be real before it would make sense to them. Anatomy in abstract terms and without an obvious implication for patient application, was just words on paper. They expressed it like this: *I need to understand why* (Susie₁), *I can learn things, like vocabulary of a language, but I really do like it to have some sort of meaning* (Janice₁), and *dissection brought home the reality of it, for me* (Richard₁).

For Susie, understanding the place of anatomy in the real world was the key. In her lifeworld of problem based practice, and her need to see the whole before she could see the parts, Susie described her different approach to learning and applying the subject:

Susie₂: *So my way of learning is seeing a situation, for example yesterday with the claw toe (I'm doing it again, showing you a claw toe with my fingers), I'll always remember now...that's a claw toe....I'll think about the bigger picture, how we can prevent the corn on the apex... the pressure on the interphalangeal joint... cos I've seen it in action, I've seen people's in action and I look ahead.*

But for her, if explanations were *woolly*, learning aims were not directed, or there were too many perspectives to draw on, Susie would not find her way to understanding. A description of this came when she reflected back on her experience of dissection in year one:

Susie₂: *I've thought about the dissection and I almost think that would be more relevant now. In the first year I didn't understand what I was looking for. So you see the muscles, you're pointing out what they do, but because I haven't seen it in a real person ... in a living specimen, or the effects of it, it didn't really mean anything. Whereas if, now, in my third year when I've seen the conditions and I've seen the muscles and I've seen the effects of what happens to them, looking at the dissection now would make much more sense, because I can relate it to reality.*

For Janice, the skills that she was taught needed to have a meaning in her practice armoury before application could be successful. If she could not conceptualise their use, and had not worked up the practical skill, then she found herself undermined. Richard developed the technique of visualising anatomy through imagery; a mental picture had materialised through texts and cadavers, and he now 'saw' it in his patients:

Richard₁: *when in clinic ...you can visualise the anatomy you have seen in detail and you are looking at someone's leg. Simply because it is concealed with a layer of skin, you're well aware then of what's underneath it. And when you see someone walking you begin to have an appreciation of what might not be working as it ought to and that's why they are ...moving in the way they are moving. So all begins to make sense as you progress.*

Richard described anatomy as having a place in his clinical life, and he could retrieve the knowledge he had of the anatomical area. He saw the limbs as a *roadmap*, and he was *signposted* to structures: *My starting point with every patient is 'what hurts? what makes it worse? what makes it better? And then those answers hone my attention into those areas of anatomy (R₂).* But it was not always this easy for Richard as illustrated in this next description, given following a lengthy explanation of a learning episode where he and the tutor discussed the diagnosis of a complaint of the knee. Richard was reflecting on his new knowledge when applying anatomy to practice:

Richard₃: *and I've since explored that the pes anserinus is in fact a description of a complex of three tendons and of course that hadn't come into my mind at all. But you see there's an example of something that comes up, it presses the button and there's no registration, but you go home and you think about that. And you look it up, well I did, then you write a bit about it, and certainly bursitis in that area, I had never figured that little area on the medial part of the knee is something that I could think about. Because people in the past have described discomfort there and I have been thinking, obviously, in quite the wrong way about it. That makes quite a difference.*

Susie had a personal experience of pathology, and this experience enabled a detailed understanding of the anatomy of that area. She used this concrete personal experience to inform her knowledge of the foot through her awareness of the actual outcome, the interventions she tried, and her consideration of the structure and recognising its role in the pathology:

Susie₁: *And reflecting on my anatomyI had plantar fasciitis for two years, absolute agony. It really affected me ...I couldn't do anything, barely get out of.... And I paid an absolute fortune at this clinic. I've reflected on the fact that I was*

ripped off, knowing what I know now, and the orthotics they gave me were useless. And I learnt about stretching exercises ...so looking back, I panicked...without doing the proper research. But now I know the structure of the bottom of the foot, if I'd just stuck with probably stretches... If I'd got that bigger picture that I know now, it's helped me I think with other people in the future who could have plantar fasciitis...

This, illustrated many times, was how she worked: experience it in clinic, investigate the context, and work back to the anatomy. Her descriptions of *struggle* were all from applying musculoskeletal anatomy, but it was not the same for her application of vascular and neurological anatomy. These descriptions were far more comfortable, more erudite and appeared as intuitive:

Susie₁: I've got experience of using a Doppler, from my other job... and ...well you are testing for different types of sensation they feel, the tuning fork is the larger nerve fibres... so in the grand scheme of things ...you take it as the whole picture... I'm quite good at that.

For Susie, in this territory, clinical practice was based in her reality; rehearsed, and proficient, and an area where her confidence was maintained.

If Janice was permitted to draw on all her experience, from previous careers, recent dissection, and present day understandings then she could see value to her anatomy knowledge and use it efficiently to predict outcomes for her patients. She recognised this need in her patients too; that some would want clear and detailed explanations, and that she could assume the role of anatomy educator. This was particularly evident in her descriptions of where learning anatomy through dissecting cadavers informed her knowledge:

Janice₄: educating patients depends on their understanding or on how much they want to know. For example I could talk about the heart ...the size of the aorta. It's like a hosepipe isn't it! It's so strong. And having that visual in my head, I can explain to the person, I think they'd get more of a flavour of how the heart works and pumps. Now it makes more sense because you've got it in perspective. I feel more equipped to talk about it, so that's really useful.

For Susie, less is more: *Musculoskeletal clinics have almost simplified it, cos we're dealing with a person....it's logical, not over-thinking (S₂)*. Clinical practice was about big picture thinking and grounding it in real patient experience, and her descriptions of applying anatomy were around quantity of knowledge:

Susie₂: What's going through my head is 'why am I doing this?' am I doing it because that's what the paperwork says we should do, and the results of it, are they going to change my management? What's the point in getting him to walk up and down, and

doing a gait analysis...There's no point, for what he wants, for what he's complaining about. He just wants something to cushion his feet.

Richard could appreciate the structure in three dimensions, relate the patient presentation back to the literature, and determine if he was witnessing normal or not:

Richard4: The impact it had on my learning is enormous. And it's certainly, in going forward in future clinical practice; it gives reality to clinical examination. If in the first year someone said to me 'what are you feeling for?' At your very highest and honest, I suppose it would be 'part of the body... I think it is the Achilles tendon'. If there was a complaint of pain, having felt you palpated along there, you would say 'well that's what I am doing'. And if someone were to say, 'well, what does it feel like? Do you think it feels like a normal tendon? Do you feel abnormality?' You perhaps would be writing fiction if you tried to answer that question because the answer is 'I'm not sure really what I'm feeling! I'm just pressing to see if the patient says 'ouch''. But once you see it in situ, and you can see a normal structure tapering down to the end of that tendon which then goes underneath the calcaneus, it's such an amazing form. You begin then, when you feel it and you can feel the muscle, it gives reality to what you're feeling later on with a living person.

Richard described this process repeatedly, over the course of the interviews. It is clearly what it was like for him to experience applying anatomy in practice.

4.35 Solving clinical problems

Podiatric clinical practice is about solving and resolving clinical problems for patients. Anatomy, and its application, is one of the subject disciplines used to facilitate this process. All students saw this as a kind of *puzzle*, a conundrum to be worked through either from an anatomical start to the finish, or a clinical finish to the start. For Richard, application of anatomy was about making connections between what he knew, what was reported to him by the patient, and what he experienced in the clinic situation. It was similar for Janice whereby she experienced it as having an anatomy knowledge base from which new knowledge could be built; nothing would change the original understandings but more detail could improve her use of it:

Janice2: I didn't know if it could be remedied. I was trying to draw on my knowledge of what I'd usually do, and I tried to see by feeling..... I made sure there was no pain in any other areas, but we could stretch the toes out, and they were very flexible. So from that knowledge of anatomy it did make sense to me that the exercises could work.

For Susie, application of anatomy was about seeing the whole, the outcome, the end; not the parts, the process, or the start. She had to make meaning of the anatomical knowledge, so for her, classroom learning had to come from the patient's problem first otherwise true understanding did not result: *maybe bringing that musculoskeletal form into the classroom would have helped me, cos then I can relate what we're going to do at the end (in clinical practice) to what we're doing now (in the theory session) (S₁)*. Through her sense of reality for or from practice, Susie's vascular and neurological anatomy and its application had come easily, so her performance in a general clinic, with patients who had those systemic conditions, was proficient. But musculoskeletal anatomical knowledge was last on her agenda for her own podiatric education: *that's why I need to know my anatomy better (S₃)*, and it had yet to make sense.

Richard visualised the body as a detailed account of human anatomy which he used to understand it in practice. Coming to clinic with a methodical mind, Richard's approach was to perform a thorough history, assessment and diagnosis, always with anatomy in mind. He described in great detail how he had journeyed from learning the morbid anatomy of year one, to the competent clinician he was today:

Richard₂: *...having a mental picture of the anatomical structure in my mind... And where that tendon inserts ... does that follow the map of what she's pointing out to me? So head, chest, abdomen, right and left leg, main anatomical structures in terms of bones, main anatomical structures in terms of muscles, where they originate and where they insert, and that's my roadmap. And when certain areas are pointed out, flagged up by pain, that's where I first look.*

Janice thrived when she knew the theory, had the skills, and could apply them appropriately to practice. Through her anatomy knowledge, this clarity of purpose made sense to her, and it made for more meaningful research into the related pathology.

But the central premise of how these students solved clinical problems was in their use of anatomy either as a tool, or as an object. Janice and Richard used it as a tool, where it was in their mind, at their disposal, and helped form a picture of the problem. Janice liked it when there was clarity in the musculoskeletal assessment and, with appropriate action, she could sense a positive outcome for the patient: *I find stuff like that, where you can diagnose, and you can categorise, I find that really useful... because I can help (J₂)*. Richard used clinical reasoning to explain his thoughts and actions. These could go from theory to practice via a patient, or from the practice to the theory, via the patient:

Richard₂: *it helps me to convert what she's telling me as the component parts of her complaint, in a bridge towards applying theory to the problems she's referring to and: the theory's built up from looking at what is represented in the book, then listen to (people's) description of parts of the anatomy that's causing the difficulty, ... it gradually builds you a database on how that structure is not functioning to its maximum, ...and you can appreciate ...what you might be able to do about it in terms of treatment or interventions.*

Susie used anatomy as an object that would help her resolve the issue. She experienced clinical practice as a kind of crime scene: *I pick up clues and cues (S₃)*, whereby she saw the consequences of the pathology first, she studied the context in which it transpired, then she would sift through the evidence to find the root anatomical cause:

Susie₂: *I'd work it out. If I see something, I'm better at working backwards. It's very obvious that he's got no fatty pad... he's just feeling every pebble or whatever it is he's walking on. I'm thinking he's got a really stiff calf, but then he's got intermittent claudication really badly, he doesn't like walking, and he's never going to do any exercises. His movement's actually quite good. There is no crepitus. I can off load that foot, cos I do generally feel the plastazote will show up the exact points that need offloading, and provide that extra bit of cushioning, and give some warmth to his ice cold feet. And that was my logic thinking.*

Susie described these concrete experiences as her means to learn anatomy and apply it in practice. She knew she needed to be challenged and in so doing, would face her fears:

Susie₃: *a lad, about 13, came in, heel pain. And my tutor said 'what's classic, in a teenager'. I don't know. He said 'well you should know, you're a third year.' I said 'fine, leave me, I will find out.' So he said 'right, at the end of the session you do a presentation on it then, to the rest of the group.' And I did. And I shall always remember calcaneal enthesopathies. I will always remember that now. So that's how I... so a lad came in, presents with some symptoms, I go to panic, everything goes out of my head. But reflecting on it, looking it up, finding out about it, it will always be part of a differential now.*

It was her tutors who provoked her into action, and when she rose to this challenge, she performed well.

4.36 Working alone, with resources, and through and with others

All healthcare education involves some sort of group interaction; indeed it is expected that students work together on comparable projects and work towards similar goals for their

learning. It is also expected that the majority of clinicians work collaboratively for the good of the patient, to bring about the best possible individualised care. This sharing spirit is fostered in the undergraduate degrees of our healthcare professions but is not always welcomed with open arms.

All three students preferred to work alone. They said: *I do prefer working on my own* (Janice₁); *I need that challenge on my own* (Susie₃); and *what doesn't particularly work for me...is the group exercises* (Richard₁). For Janice, learning was best facilitated when she was relaxed in the environment and with the people around her. She disliked being seen to be smarter than others: *I think sometimes when you're in a group it can be difficult because you might know more than another person, they might get a bit intimidated* (J₁); it made her feel uncomfortable. However, she enjoyed learning from others when they had things to enhance her own understandings. For her, without the tensions of intellectual competition, true sharing of learning had the potential to take place:

Janice₃: *I like to have the least amount of stress possible, I think is good for learning, and for experience, and for involving everybody. Then I can learn off them as well, because they may come forward with something that I hadn't thought of, or experienced.*

Susie could be highly influenced by the person she was allocated to work with: *I think the person you're working with makes a difference to you... how you feel* (S₂), and because she was finding anatomy learning such a struggle, she chose to handle it alone: *Sometimes I find working with peers difficult, not because I'm selfish but because I need that challenge on my own* (S₃). She lacked self-confidence and had a fear of being seen as less capable than her peers, or indeed her true potential: *I'll just step back. I let them take over, if I think they know more* (S₃). For Richard, learning happened in an environment where he was permitted some autonomy and the space to make his own decisions, without tutors *jumping in* too quickly: *where you have a consultation where there's no acute harm likely to the patient, tutors can be a little more relaxed in the way that they handle ...your interaction*(R₂). By year three, anatomy had become clear to Richard and he spoke comfortably of its application. He described having achieved this largely through his own independent study. However, Richard did recognise that his learning was made stronger by the different perspectives his colleagues brought to the table: *it brings, if you like, a richer experience because it's not you in a mono-fashion approaching that learning* (R₁).

Anatomy knowledge comes before understanding and the students described the resources they used to learn it. Most significant were the use of printed materials, electronic devices

and dissection work as examples of working with resources. Books were appreciated for their clear diagrams and visual representations of anatomical design. Anatomy Apps were an instant resource, easily accessible at any juncture of the day and used for those details that are hard to remember. They displayed complex structures in more simple terms by offering a three dimensional image and rendered structures more recognisable for clinical application. Dissection in year one was considered *useful* (J₄,R₄) but students had not yet understood the significance of what they were seeing. By year three, for two of the students at least, dissection was described as seeing a form of reality and not only were they able to put anatomy into perspective, deepening their understanding, but it allowed them to link normal anatomy with the change in structure due to the ageing process. Dissection in year one *provoked thinking* (J₁), but in year three was described as more of *an exploration* (J₄) and an opportunity to amalgamate all of the podiatry subjects taught across the programme. Dissection had its limitations though. Being a hard fix embalmed body, structures can be hard to differentiate and it is not possible to bring about function due to structural vulnerability and joint immobilisation.

All the students discussed their use of literature and texts to inform their anatomy understanding, but it was the biomechanics literature that tested them the most. Janice was the most comfortable, coming to embrace the ideas of theorists as applied to biomechanics and saw these theories as clear-cut and absolute: *it has taken me a while to grasp and understand some concepts; movement, forces. But then I think once you get them, they are quite straight forward* (J₃). Through them, she considered her understanding of anatomy and its function had been strengthened. However she also described them as a distraction to her retention of anatomy knowledge:

Janice₃: *...the anatomy's, not gone out the window coz it can't, but it....(long pause)
I suppose I try and, I'd have to keep going back to revise the anatomy to integrate that into the theories that I was trying to explore or apply.*

Richard used these same theories of biomechanics not as the principles they were designed to be, but as a *working benchmark* and a *tool* in finding out *how far an individual has moved away from what a theory would consider to be 'a norm'* (R₂). He described having a wary attitude towards them, maintaining a sceptical view in his interpretation of them:

Richard₃: *I actually think of them all as parts of theory of foot motion. I don't try and look at them as individual theories, because the difficulty is when you read them, some commentators will write very complex commentaries, and some of that commentary I think is wishful thinking or it's academic wistfulness because you'll*

then get further research and commentaries that start to contradict, and all that does to the student is cause confusion.

Susie wanted to understand anatomy, but found the sources from which to learn confusing. She recognised there is debate, but wanted to find an answer she could relate to; her sense of reality. She experienced this as chaotic: *whoever you ask, you get a different opinion* (S₁). Susie liked to simplify anatomy for herself so that she felt more comfortable with its application, and was therefore disinclined to use theories: *the theory of what I'm looking at doesn't enter my head unless someone says 'what theory could you relate that to?'* (S₂). As has been described in previous constituent parts, Susie problem solved by considering generalisations rather than specifics, and worked back from the patient to the anatomical theory.

Clinical tutors and lecturers of theoretical podiatry were a feature in all three students' descriptions, but it was with regard to the musculoskeletal clinicians they had most to say. All three described these two tutors as *experts* who had very different ways of approaching the practice of musculoskeletal anatomy, and of approaching teaching. They experienced their musculoskeletal specialist tutors in different ways; one had a *science based* approach and was a *measurer* and *academic*, whilst the other was more *visual* and broke musculoskeletal assessment down by *simplifying things*. This was experienced as complimentary, and *you pick out of the two, don't you* (S₂). These specialist musculoskeletal tutors appeared to have helped bring all of them to a place where they had the knowledge and skills to apply anatomy effectively.

For Janice, effective application of anatomy happened when she felt safe; nurtured and not hurried, heard and not derided, taught but not underestimated, assisted but not undervalued. Richard experienced anatomy and its application similarly. With his increased aptitude in applying anatomy, Richard described how he had earned his patients' confidence and trust, and any thoughts of inadequacy were now rarely felt. But Susie, still being far less adept at the application of anatomy, described her appreciation of the challenge her tutors brought to her learning. She described them as willing her to perform better by throwing her *in at the deep end* (S₃), and her rising to that challenge by her *stepping up to the plate* (S₂). For Susie, these were lived as moments of clarity, where *the penny dropped* and *I will always know that now* (S₂).

4.37 Recognising (in)competence in self and others

In the presentation of each constituent part to this point, the examples that have been given of student descriptions for those parts have also demonstrated both competence and incompetence in their ability to apply anatomy to podiatric practice. The students were not shy in describing what went well, and equally what they saw as their learning needs. In all cases, they compared themselves to their lecturers and tutors, saw expertise and proficiency in those clinicians, and used them as a *benchmark* to measure themselves. Richard described himself as a *regular taxi* but had yet to get his *black cab badge* (R₂), meaning that for him, he was not quite at the level of some of his tutors who displayed all the attributes of a *fluent* clinician; his definition of anatomy fluency being an ability to apply anatomical knowledge and concepts accurately and quickly. He described *being entitled* to some autonomy now that he had reached year three and:

Richard₂: *we (he and his tutors) very often now align in our thinking, but if they jump in too quickly, they are taking a snapshot of microscopic aspect of that consultation which can not only give a distorted view, but it can knock the direction of that consultation for the rest of that patient session.*

Richard experienced this on several occasions for which he gave rich description. Janice admired her musculoskeletal specialist tutors and *tended to ask their opinion because I know they know everything* (J₃). This also presented her with a dilemma; to depend on their extensive wisdom: *I want to learn from them* (J₂), against being independent in her learning: *sometimes it stopped me thinking for myself* (J₂). She held her tutors up as role models and expressed that she felt secure about her learning if she had it confirmed by them.

Susie described learning by seeing and experiencing real situations. In general clinic she was competent and confident when applying her knowledge of vascular and neurological anatomy. It was not so for musculoskeletal anatomy. Susie needed guidance to have the learning revealed to her: *I'm not very good at self-directed learning, sitting in a study room floundering, wondering what shall I do today?* (S₂). However she fully recognised that she *shuts off* when learning was too difficult or she did not grasp it, but *when I'm engaged, I'm really engaged. If it's something I've seen before, or I understand it, I learn more...* (S₃). Susie was encouraged to think differently through the anatomy teaching in year three. It was *the first time I've been faced with that thought process and I haven't been challenged in that way before* (S₃). She found this instruction far more accessible when learning and applying anatomy.

Susie believed learning anatomy to be a *brain type*: *you see other people either excel at it or struggle like me* (S₃). She knew she was not comfortable with anatomy, and could see that others were. Janice described it as *scientific* and her *friend*, and Richard used anatomy language as if it were his native tongue.

For Janice, learning needed to be relevant to be remembered accurately, and her recall was sketchy if too long had passed between the teaching (knowledge) and the application (understanding). This was certainly the case for applying anatomy theory from the classroom to the clinical practice context, but equally so for assessment skills acquisition:

Janice₂: sometimes we're shown tests and we might not use them for a while. And it takes a while for things to come back. I have confidence because we've come across it before, but then because I can't remember it all it sends a bit of panic into my head ...and you want another demonstration and then realise why you're doing that test.

When this happened, it undermined Janice's confidence and her ability to be efficient and effective in the clinical situation. Conversely, if the repetition of the anatomical test or skill was too soon between teaching and application then she recognised that she was merely experimenting and that competence was yet to be gained.

For Susie, this podiatry degree had caused her to feel *deskilled*. Her prior knowledge and experience in nursing was often at odds with her current education in podiatry and she was fully aware of her varied forms of incompetence. This made her feel unnerved and embarrassed, even ignorant, and she called this *stupid*. In fact, Susie was a proficient clinician in her own right:

Susie₃: having been a good professional person, starting again is really hard. And it's almost like you're stripped of all your confidence. Made me question everything, and feel stupid. And then I'd go back into the environment that I've come from, and think 'oh maybe I'm not so stupid'.

Conversely, Richard thrived when he could demonstrate his competence, acknowledge his shortcomings and recognise his developmental needs. He described his journey from the early learner of year one where he followed instruction, practised skills and tried to make sense of anatomy, to the mature musculoskeletal clinician of the present day, finding significance and meaning in all the clinical problems to which he had gained experience. He recognised the importance of the road he had travelled:

Richard₂: When I understood, broadly, what I thought I was looking at then was theoretically based, classroom based. And it arose out of lectures. I can't say when I first heard of gait, human locomotion, inversion, eversion. My head fully

appreciated in a more three dimensional sphere what I was looking at, or perhaps what I thought I could see, in someone walking. But as the course progresses, and as you struggle to convert the theoretical, and the more formal representation of the body's motions from helpful but fairly artificial diagrams, into a human person actually walking, or squatting, or their movement in response to pain, you slowly but gradually and surely begin to see a representation of what's then theoretically being referred to. And is it akin to the normal representation or are they showing you something that's abnormal, or actually normal? And only then do you fully appreciate reality rather than just the technical description.

Janice also described the long anatomy journey she had travelled:

Janice₃: I think because we've covered a lot, I'm a lot more confident that I learn things quicker. Because I think I've trained my brain to be able to grasp things. I think I have developed the way I learn, and know what does work for me. Like visual does work. I know saying things out loud works for me. I think previously I have been very used to just writing, and thinking because it's written you know it, but you don't. You have to be able to explain it, and understand it. I think as well from having more of a broad knowledge of anatomy, that... you know somethings not going to come up that's a complete revelation, shifts a paradigm. I mean there are probably thousands of paradigms to shift, but you know that there's not things that are going to 'oh, if I had known that, I would have gone about that differently....'

All three students strived to do the best for their patients, saying things like this: *I want the patient to leave knowing that I've done all I can* (Janice₂), *I have concern for the patient* (Susie₂), and *I think patients' confidence and trust is hugely important* (Richard₂). All the anatomy they had learned, and the endeavour to apply it effectively to clinical practice was evident throughout their descriptions. Richard and Janice were very confident in their abilities and were comprehensive in their approach, particularly to musculoskeletal care. Susie was applying as much anatomical knowledge as she considered she needed to make the best and most ethical decisions for her patient: *I'm a logic person. I don't over-think the anatomy side. I say what I see*, such that: *I'm not going to cause any harm* (S₂). For Susie, this is what she expected of herself and any musculoskeletal condition more complex could be referred on. She even had this approach confirmed by her expert tutor as appropriate.

The final word on the constituent part of (in)competence of self and others belongs to Richard. Richard enjoyed the challenge of the complex clinical puzzle, as if it were a jigsaw where the final piece was lying obscured under the table, waiting to reveal the complete

picture and know conclusively he had accomplished all he could. In this rich description Richard is describing a patient episode whereby a cause of a pain was elusive, even for the expert clinician. Richard at last discovered its origin:

Richard₃: *The last chap in the morning was a gentleman who had been retired for six months, and had developed heel pain, and the heel pain was getting worse and he couldn't find anything that was helping it. But from our point of view, I think without spending, investing a little bit of time on some talking, we probably wouldn't have got very far. Because I said to him 'do you do anything that aggravates that?' 'No, no, no' he said. And then in exasperation I said 'do you do anything now that you didn't do when you were working?' 'Oh, I bought a boat, and I'm doing the boat up'. And asking him a bit about the boat, he bought the boat to amuse himself, the boat wasn't in best condition, and so he is renovating the boat. It was operative but when he took it out, the throttle, which was new to me, could be operated by the toe and the heel of the right foot. And it was a stiff throttle. And so the break part of the throttle was operated by the heel. And only by beating that two or three times would he get the thing to work. So he'd been banging his heel. It didn't occur to him that that was anything new or aggravating. But it turned out to be insertional, Achilles insertional tendinopathy.*

4.38 Reflecting and acting on experience

Throughout the undergraduate podiatry degree, it is intended that students take a reflective attitude to learning and positive action to enhance their experience of podiatry. All three of the students in this study did just that. In coming to understand what reflection is, all three read around the subject and used it in their lifeworld: *it's about experiencing something, seeing something in action, and realising maybe that wasn't right (S₂)*. Richard described his use of reflection in two ways: as a method of thinking deeply, and the approach of using reflection as a tool to drive new ways of understanding:

Richard₃: *I do reflect, and the process for me has several functions. Reflection for the sake of reflection, but its reflection almost as a form of revision of that clinic, and what's happened that's new that you can add on to what you got from before, to take that forward for next time to apply **that**.*

Janice made a point of reflecting on what she saw to capture, revisit and add to it. She recognised she had done this all her working life, although now she could put a name to the activity. Susie conversed with herself during clinic. These self-reflective questions helped

her challenge her decisions, plan her care, and see the bigger picture for the patient. In so doing, she kept relevant that which she experienced as useful to make meaning:

Susie₂: I reflected on the situation and I look at the long term bigger picture. .. not just the here and now. I think of the effects long term. So how am I going to prevent anything detrimental happening to the patient.....

These self-posed questions, together with her new understandings, motivated her to reveal a fresh perspective based on concrete experience and reflection. She described these kinds of instances as *in the brain*, never to be forgotten.

For Susie, her perceptions of applying anatomy changed when she found, through personal experiences, the significance and relevance of anatomy structure and function: *in year one I learnt parrot fashion... because I couldn't relate it (S₂)*. But following reflective scrutiny of her personal podiatric concern she was able to:

Susie₂: reflect on that... if I'd got that bigger picture that I know now... if anyone presented with it in the future, from my own learning and discomfort, I would be much wiser, better, to advise and look at it.

For Janice, learning anatomy had started as a slightly overwhelming experience, but by immersing herself in the subject and making time to think things through, she overcame these feelings:

Janice₁: I found it quite.. there was a lot of stuff thrown at us. And I thought 'is this all going to fit into place?' But it does, it does all fall into place, but you just have to keep chipping away at it.

For Richard, reflection was a routine, a practice, a habit. To articulate it, he discussed his preparation for anatomy learning, his expectations for the experience of application, and the outcomes that were confirmed or refuted:

Richard₄: you've got books and examples and you're being told things. So you have to believe that, or you work on what you're shown and what you're told. But as that wheel goes round, the books and what you're told becomes your early experience in year one with the cadaver, which is useful and it has to be a starting point. But then when you've got the gap where your initial learning 'books and what you're told' is added to, and you begin to understand more fully structures, functions, and how they operate and the 'books and what you're told' takes on a whole new lease of life; so what was a benign planned learning experience and you don't really appreciate it at the time, as that develops forward it develops into something which is quite astonishing in the way it affects your learning, and your appreciation of how learning in progress has produced something.

So reflection for Richard was about supporting himself, analysing situations and context, and drawing conclusions for action. Janice saw reflection as an expression of how she came to realise something and she could now work with the new meaning:

Janice₁: *...because what I wanted to put across was my reflection, how it changed me, made me realise things...changed me into being more steadfast in clinical practicehaving the confidence that you have the knowledge.*

She reflected that she had gained clinical efficacy through her competence of anatomical knowledge, understanding and clinical application. Any inadequacy of her knowledge weighed heavily on Janice and she saw learning as an obligation: *when you reflect on a particular incident, it does make you step away and ensure that your presence was conducive to a good experience for the patient (J₁).*

As has been described in previous sections, Susie was intuitive about general patient care. But for her musculoskeletal encounters she needed to use reflection actively to see anatomy and its application in a new way; as a thought process, as relevant to diagnosis, and in recognising her shortfalls:

Susie₃: *I need to know my anatomy better. So by asking (the patient) to point exactly where it is, I should be able to think, right that's the whatever. What in that area is going to cause.... what tissue? what joint? what ligament? what muscle am I talking about?*

Richard displayed particular clinical behaviours developed throughout his professional life. He was insightful about this and describes multiple occasions where it occurred:

Richard₂: *yesterday's reflection certainly brought up to the fore ...that unless you approach clinical application of anatomy in a methodical way, then it's going to be a more comprehensive and a more reliable method than if you just go for it in different bullet points, you're more likely to miss something.*

If, on the other hand, his method was disallowed or thrown by a question he did not know the answer to, it interrupted his ability to apply anatomy to the situation. As he acknowledged: *I will be happy to fall on my sword, if I am wrong. But if your method gets disturbed, your presentation just breaks down (R₂).*

What has been most impressive over the course of the student interviews is in how articulate these students were when describing their reflections, and the recognition of how they had transformed. They had travelled on different paths, embracing learning of anatomy and its application to clinical practice in individual and distinct ways, and each had faced their own fears and had to alter perceptions of themselves and their practice. They had to be critical

about the limits of their knowledge, skills and attitudes and had frequently experienced changes to their perception of reality. This is all critical reflection; a concern with the reasons for and the consequences of what we do. Janice felt a compulsion to learn anatomy, not just in parts but as a comprehensive knowledge of the limb as applied to musculoskeletal podiatry practice so that she may tackle anything that presented in her clinic with competence and confidence. In year three, Richard applied a new understanding of anatomy of the knee to his past podiatric patient experiences to reveal an inadequacy that had been in him from the beginning. When he looked at this incident critically, he thought that it was possible he had not given optimum care to several patients who had gone before, despite his resolve at the time, and was quite disquieted by this realisation. And Susie was challenged to question everything she believed to be true, both those practices in which she was already held as an expert, and in new podiatric learning. For her, reflection was a critical process of self-expectation, self-adjustment and self-correction. She berating herself repeatedly and questioned the whole premise on which she had built her clinical practice. She became enmeshed in the emotion of this thought:

Susie₃: I've learnt, of course I have. Course I've learnt loads over the last three years. Course I have. Maybe I seek perfection, I don't know. Maybe I expect too much of myself, I don't know. Maybe I think I should be here, the standard I was at work, and that's why I feel de-skilled. Because I'm not. I don't ever think I'm better than anyone else because I'm not, I never have been, I haven't got that attitude! At all! But I didn't expect to feel so, so deskilled.

Examining her life-held presuppositions was acutely uncomfortable, made her take on a new perspective, and at the time of the interviews was having the effect of undermining her confidence and her belief in herself as a professional.

Using Giorgi's descriptive phenomenological approach, the analysis of the transcripts has been rigorous and detailed and an identification of the phenomenon of learning and applying anatomy has been made. Through the presentation of the findings in this chapter, the experiences of three students of podiatry of the learning and application of anatomy, and what meaning these experiences have held for them in their lifeworld, have been made known. The next chapter is a comprehensive discussion of these findings.

5.0 DISCUSSION

The discussion of these findings is in two parts. Section 5.1 presents a detailed inductive discussion of the phenomenon of learning and applying anatomy. There is a subsection for each constituent part which starts with a summary of what was extracted from the findings, followed by a discussion of those findings. The phenomenological reduction is such that I have been open to the students' experiences and the meanings implicit in them, and have maintained an educational phenomenological attitude throughout. I have practised epoché with the result that the discussion is unimpeded by my own intelligences and assumptions of learning and teaching anatomy, and my understandings of applying knowledge in practice as a podiatrist.

In the second part of the discussion, section 5.2, I have lowered the reduction of epoché and have provided a deductive theoretical analysis of the phenomenon of learning and applying anatomy. It is an examination of each constituent part in light of the literature, both phenomenological and other, of learning and applying anatomy, and with other literature that relates to the character of the constituent part.

Section 5.3 is a critical evaluation of the study, noting the issues of rigor, process and method in conducting descriptive phenomenological research of this kind.

5.11 Assuming a learner-ready attitude

Students are either motivated to learn anatomy, or not, or to learn some parts of it over others. They may either be driven to or repelled from engaging with that learning depending on how challenging they experience the discipline and in what situations. Students are aware of their methods of learning and of their individual learning preferences, and they prepare for specific learning occasions: classroom, cadavers, and clinics. When in clinic, students are motivated to apply anatomy through a sense of responsibility to the patients.

Anatomy is a complex subject and it requires considerable effort to learn it. A readiness to learn anatomy can be enacted through an immersion in it, offering a sense of familiarity that is a constant revision aid and renders anatomy language comfortable to use. The development of mnemonics and analogies can help to reinforce the fundamentals of anatomy and may strengthen the transfer of knowledge when used in practice. A student's prior experiences may influence a readiness to learn a new subject if that subject is seen as less educational and employment background can influence what is meaningful. For instance, Susie was a medical nurse and had not developed an invested engagement with anatomy, there was no identified personal interest, and it did not hold meaning for her in her life.

Indeed, anatomy only held any meaning for her once it was used as an instrument to solve her clinical problem, and she was far more ready to learn anatomy at that point.

The learner-ready attitude lowers when personal known and practised ways of learning break down. This affects students' ability to think, communicate, and interpret information which results in a feeling of demotivation. Minds drawing a blank, mental freezes, and panic were all expressions used to describe these feelings.

Assuming an attitude of being learner-ready appears to be influenced by a sense of self-awareness. Students are aware and may have an informed opinion of how they tackle learning however they may not have had to articulate it before. This awareness and readiness to learn may be enhanced through experiencing the subject in the classroom and then applying it to practice, or from seeing the consequence of pathology and working out the anatomy from there. The first approach involves retention of knowledge, prior peer practise, skills acquisition and problem solving acuity. It originates in classroom settings and the experience of working with cadavers, and can establish anatomical knowledge and competence which encourages a learner-ready attitude of being motivated and independent in the clinical environment. The second approach is of starting with the patient, and working back to the structures learnt in the classroom. This problem based method is counter to the general teaching and learning strategies adopted in this podiatry course, with the consequence that the student who learns in this way may appear less learner-ready earlier in the course, but may develop that motivation to learn anatomy once they have entered the clinical setting and are using anatomy in practice.

Students may prepare to learn anatomy through knowing how it will be taught. Morbid anatomy is often taught through lectures and working with cadavers. These methods are acceptable, welcomed and enjoyed by some students. They like the detail of structure, the fascination of the parts and the science of the subject. In the anatomy room, they benefit from seeing the individuality of the parts and the assembly of them to make a whole. Anatomy seems to make more sense and permits students to make connections between all of the aspects of anatomy they are learning in order to understand function and apply the subject in the clinical context. Indeed, classroom and cadaver learning can be inspiring and therefore motivating, and prepare students for the musculoskeletal clinics they experience in practice. A particular mental attitude is adopted when working in these musculoskeletal clinics which is an active process and requires an investment of effort. The effort invariably pays dividends though, as students thrive when they can demonstrate their competence, acknowledge their shortcomings and recognise their developmental needs.

Not all students are motivated in this way. The anatomy classroom can feel daunting, dissection may not be relished, and the relevance of the anatomy being learnt may not be clear. Consequently, they may not be learner-ready. Once in the clinical environment, these students may display behaviour of being at ease with patient care and with the general skills of patient assessment, and possibly flourish in the medical management of the patient. Having learnt less in the classroom, they are more likely to be challenged by musculoskeletal assessment, possibly not so much by the hands on practise but by the communication of it to others. The terminology, the physics and the nebulous nature of having to picture that which is under the skin may leave them with feelings of inadequacy. However given the right teaching, a good steer and appropriate challenge, they can be supported in their learning and can feel valued and motivated.

The students' adoption of a learner-ready attitude is also revealed through a sense of responsibility to the patients. Students want to do all they can for patients, including their appropriate and adequate use of anatomy in podiatric care. They feel morally and ethically obliged to do the best for patients, expressing values of honesty, fairness, respect, trustworthiness and commitment. Integrity is also a value in anatomy learning. There is a desire to practice anatomical health promotion as well as prevention, and to see education of anatomy function as a shared commitment for both patient and student. This sense of commitment to the patient also presented itself in students' patterns of behaviour.

5.12 Employing patterns of behaviour

Students have a particular pattern of working which makes them view the discipline in distinct ways, and enables them to feel comfortable in the clinical situation so they can concentrate on the less expected circumstances of clinical encounters. They feel responsible for the complete person, not merely the anatomical part that causes pain, and they have a particular way of engaging with learning to inform their clinical practice.

Students employ behaviours very early in their course, which appears to characterize their learning throughout the remainder of their podiatric education. The learning of anatomy can be a constant challenge and needs to be used in practice regularly to retain and recall it. Students need to address clinical practice in their own way or risk the personal chaos that ensues. These ways of applying anatomy would seem to relate to their initial tackling of anatomy as a subject, either in a linear direction from the classroom to the clinic, or as a revisit once the reality of clinic had been established. Linearly, by utilising the dissection work, lectures and other strategies of the classroom and by adding students' own personal

learning methods to grasp the subject more thoroughly, there is the potential that by year three they will understand anatomy sufficiently well to be relatively comfortable in its application in the musculoskeletal clinical environment. Some students seem to be consciously aware of their shortcomings, but on occasions unconsciously unaware of what they did not know. It would appear that students need to exercise some flexibility in their methods though, otherwise they can experience the mental blocks described earlier (section 5.11).

On the other hand, through the pattern of behaviour that dictates that the consequence for the patient needs to be known first before the anatomy can be applied, students try to employ strategies to help them find the relevance of anatomy and make better sense of future clinical situations. It is sometimes easier for these students to learn anatomy when they have experienced a personal podiatric complaint for themselves, or someone they know well has undergone a form of musculoskeletal treatment. They can use these experiences as a basis for learning in the classroom to bring about new understandings of how structure influences function. This fresh perspective of the anatomy offers an applied understanding based on concrete experience and can be the foundation for the way in which they can come to know and apply anatomy. However, unless this approach is supported by teachers of anatomy, students who learn in this way may not be aware of the shortcomings in their anatomical knowledge and understanding. This can have a demoralising effect.

Students can experience a sense of reawakening of their prior knowledge which offers them new openings of learning. As they progress through the course, their early anatomy learning of disparate pieces of structure comes together as full and complete pictures of the body in function. They move from grasping two dimensional images to translating them into three dimensional movements. This is the reality of practice, of patients, and of problem solving. As Susie, Richard and Janice describe, if students are afforded the chance to use their own initiative, it allows them to apply their systems to more complex situations. This gradual shift from dependence to autonomy helps build their confidence and may strengthen their resolve to tackle musculoskeletal podiatry effectively. However, some students see the application of anatomy as exclusively patient focussed with an orientation to the person in front of them. They see the patient as a whole being, a living functioning person with a problem to be solved. The patient comes first and anatomy is not prominent in the mind until the situation dictates it be brought to the fore.

Students often see the theory of anatomy, and of biomechanics, as abstract. When theory is brought together with concrete patient experiences, students can make meaning of the

anatomy and make connections with practice not previously elucidated. For them, the patient is the conduit between theory and practice (and occasionally the other way round). Gradually, the students' thinking begins to align with tutors' and they can experience a feeling of competence in practice. Some students have sudden moments of clarity where they experience instants in their thinking and an illumination of their learning. But this kind of learning is hard work and a student could just as easily shut off from learning because of their perception that anatomy is hard.

Referring then to the first constituent part, that of assuming a learner ready attitude (section 5.11), and of anatomy being seen as a complex subject, students express a compulsion to add anatomy to their learning to support the patient interaction. There can be a deep motivation to see anatomy as more than just complex language and an exercise in memorisation, but to use it through a cognitive process of problem solving which would hold relevance and meaning for them. They can see knowledge as the start of making anatomy work for them in clinic and experiencing its use to find a solution to the problem. What serves to strengthen students' behaviours are the way they tackle anatomy; by seeing it as a whole, or by breaking it down into its parts.

5.13 (De)constructing anatomy

One constituent of the phenomenon of learning and applying anatomy is that students tend to either break anatomy down into its structural parts and rebuild it to make a whole, or they see the body as a whole entity and only focus on those parts that are necessary for applying effective care.

The study of detail is attempted through lectures, online and printed materials, but it can also be through anatomical dissection. For many, this is where the reality of anatomy can be appreciated: its size, location, association with and relations to other structures. Through the cadaver, students can visualise science. By using sight, touch and their imagination, they can study the parts, and then piece them together to make the whole. This 'seeing' can change a student's perception of reality by demonstrating how their understandings of the smaller things could enable them to grasp the bigger picture. Indeed the reality of a cadaver can be surprising and impressive. Dissection can also be disappointing though. The idea that the cadaver is a deceased person, with an unpleasant odour of embalming fluid, can be distracting. Perhaps when detail holds no meaning and the parts appear simply as an assortment of structures, dissection fails to bring the clarity that may be so desperately sought and the learning opportunity can be lost.

Anatomy terminology is something that all students of medicine and allied health have to grapple with. Some treat it like a foreign language and use the strategies one would use for learning Spanish or French. If viewed in this way, the language is made up of the vocabulary and the grammar: the names of structures would be the vocabulary, whilst the terms to signify movement, place and space denote verbs and adjectives. Not everyone would class themselves as a linguist however, and enjoy learning another language. But anatomy is not always communicated using spoken language. It is possible to know the anatomy and its movement without being able to recite the anatomical terms associated. For instance, Susie was so troubled by the language of anatomy that it took over her ability to communicate the function and therefore the diagnosis. When she was told to describe what she saw, she could explain it in layman terms and that was totally acceptable to care for her patient. But is this adequate for podiatric practice? Would she take this view if the language was of renal disease or diabetes? It is possible that those students who experience applying anatomy as a problem based concept are simply slower to learn the language and may do so using a conversational method instead, as in ‘conversational French’.

Constructing and deconstructing anatomy can also be viewed as a jigsaw puzzle. Students may take each piece and study it to form a database of knowledge. What is its size, its shape, its defining features and what does it look like? What other piece would it sit comfortably with and if all connected up, what would the resultant image be? In formulating the structural picture, these students can work out the applied function and use this to help them diagnose patients. Other students may see the picture first; not an anatomical picture but a holistic patient picture, and only when one part shows an anatomical feature may they turn to anatomy for cues.

When learning anatomy, students often enhance their understanding by deconstructing and reconstructing parts using a technique of recreation. They may draw it, make models of it, superimpose it on themselves or make games about it. In these ways they can work on its detail such as its intricacies, proportions and perspectives. In practice, anatomy is not realised like that. Students must see, touch, palpate and often visualise it to appreciate its function, or malfunction. They are having to translate what they know of some anatomical thing into what they experience in or on a patient of that thing, and then make judgements about the quality of that thing and its function. They then have to vocalise and discuss their findings. Some choose to do this by grounding themselves in the knowledge of parts, others by looking at the whole.

5.14 A sense of reality for or from practice

To make any sort of cohesive sense to students, anatomy has to be real. By having anatomical knowledge, clinical assessment skills and multiple experiences with patients, students feel empowered. Knowledge can empower a student to understanding, practise can empower a student to competence, and familiarity can empower a student to be confident about the care they are giving.

As has been discussed in the (de)construction of anatomy (section 5.13), dissection is considered a vehicle by which reality can be experienced. Working with cadavers to reveal structural parts, interconnected anatomical associations, and even some pathology such as atherosclerosis (hardening of the arteries), joint arthritis and bone marrow disease, offers students a means to change their perception of reality. Learning anatomy in year one appears to be about systematic and technical knowledge. Students go through the motions but they have little experience with which to come to understanding and underpin their practice. But several years later, having experienced relevant assessment in practice, anatomy can be stripped back to its raw form again and seen with fresh eyes. Dissection opens their reality to new scrutiny, affording some students the space to look at their understandings in a different way and make a renewed sense of the anatomy they use in practice. This knowledge is empowering as they can grasp understanding in fresh and applied ways, work through patient problems and formulate appropriate management actions. Good patient outcomes make for confident students.

But empowerment through knowledge doesn't have to come from working with cadavers. Students may simply see the lower limb as an appendage full of joints, muscles, tendons and ligaments. They may not see these as individual parts, but as collectives that explain the whole. This is taking an open-minded approach to knowledge in which patient complaints can be described in terms of general anatomy and not require the detail of individual pieces of anatomy. For these students, dissection may not be important for their learning, but the outcome is no less real.

This study suggests that practise can empower a student to competence. Having been provided with a lecture, or shown a skill, or been exposed to a cadaver, students need to put their new learning into practice as soon as possible. Active performance of the skills in the form of clinical tests, joint manipulation and palpation of certain pathologies on the patients can be powerful motivators and consolidators for learning. Observation is useful, particularly if being performed by an expert, but repetitive practise gives a sense of reality. For instance, students can feel the size, shape, ease and quality of movement of a joint and also describe

and discuss what they encounter. This concrete experience can strengthen applied learning and lead to competence in clinical skills application.

With the familiarity of anatomy, the appropriate and associated skills acquisitions, and the regular and frequent occurrences to apply both in clinical practice, students can be empowered by their own confidence. With increased proficiency, students can become more sensitive to patients and their general health behaviours, and knowledge of normal and pathological anatomy can help them formulate the words they can use to explain malfunction.

So why is clinical experience necessary? Experience is that which occurs in both the past and present, and in both personal and professional life. Anatomy is experienced by everyone and is not simply a medical discipline: the bruised bone when being the adventurous child, the sore throat and lost voice through a common cold, and the swollen joint when it has been struck by a hockey stick. It can be more practically felt through sport (Janice cycles, Susie runs), exercise (Janice's yoga) and even illness (Susie's plantar fasciitis). Students experience anatomy learning as a reawakening of these known facts, and of prior professional knowledge when they have had formal anatomy learning in the past. They then make a connection with their present day classroom understandings. These intelligences assemble when the students have exposure to clinical experience. This study suggests that the more something from past occurrences is recalled, the more useful it is found to be in the present. And the more real it is experienced in practice, the more benefit it becomes in the applied context. In addition, applied learning comes through making connections of what were originally disparate pieces of anatomical information with new understandings of real patient encounters. As new understandings are taken on board, past experiences which initially meant little or nothing now take on new and valuable meaning.

The agent of all these experiences is the patient. These consultations are real in that the public is referred to the service for efficient and effective podiatric care. The clinics are not simulations, do not employ expert patients or ask people to behave as models on which to practise skills. This reality holds significant meaning for students, and they have a sense of legitimacy, professionalism, and of responsibility for care. This responsible approach has previously been discussed in the constituent part of assuming a learner ready attitude (section 5.11), but it carries equal weight in this constituent. To bring about a sense of reality for practice, anatomy is used as a tool to communicate with and by patients. Patients are asked to point to the pain, move their body part, or walk along a corridor. Students need to get to the specific anatomical facet, work through the problem, diagnose the condition and

formulate a management plan. For this to work, they must make sense of the anatomy they are assessing and make meaning of the discussions with the patient. Then the students need to educate the patient by explaining the problem, the diagnosis and the plan.

5.15 Solving clinical problems

Students experience the consultation with patients as a problem solving exercise. The solution to the puzzle can either be unravelled from anatomy theory to clinical outcome or from pathological consequence to anatomical cause.

Students appear to be motivated by the challenge of the puzzle (see assuming a learner ready attitude, section 5.11). Anatomy knowledge plays the largest part when the problem is solved by drawing on past and existing anatomical knowledge, using hands-on skills of manipulation, and communicating with the patient to understand their account of pain and/or loss of function. The student can then determine the necessary action. In this scenario anatomy knowledge is used systematically. The anatomy may be the foot and areas local to it, or may involve the knees, hips and spine and various internal organs. In these situations, students make sense of the complex situation in front of them by relying on theory and applying it to practice. The same is not true of the clinical problem solver who works from the patient. A situation arises where the consequences of the pathology for the patient are evident and the student perceives the function before considering the anatomy. The patient story is established and all medical assessment is performed. If the road leads down the anatomy path then anatomy knowledge is used retrospectively. If not, then anatomy is disregarded altogether. So do both of these approaches work equally as well? Are both appropriate for every patient situation, and if so, is anatomy knowledge that important at all?

The clue to the answer lies in how students experience anatomy in patient care. The study revealed how students used anatomy in their daily practice either as a tool, or an object. If used as a tool, it is the detail that is important and it forms a part of the armoury of knowledge. The part can be visualised giving clarity to its function, and the process of problem solving may be explained using clinical reasoning. This is a theoretical approach. Conversely, if it is the final piece of clinical information obtained, having established the context for the patient in all respects other than anatomy, it is then used as an object. The joint, for instance, is stiff, or painful, or deformed and if a certain therapy is applied such as joint off-loading or joint realignment, then resolution of the pain may be the result. Being knowledgeable about anatomy is not the imperative in the second circumstance, but may be an intuitive approach to solving clinical anatomical problems.

5.16 Working alone, with resources, and through and with others

Shared learning, group work, academic collaboration and teamwork are all considered essential components of a professional healthcare course. However, this may not come easily to some students, perhaps because they are used to working alone, they do not see the value, or they have some underlying self-vulnerability. Clinical tutors would appear to hold the most significant role in the learning and application of anatomy, with printed texts and theories of biomechanics playing their part.

Shared learning in the context of clinically applied anatomy may be experienced through a great deal of tension. When working with peers, students tend to measure themselves against these others, which could be a comfortable and positive experience or an anxious and embarrassing time. Working alone is sometimes considered the preferred mode, but it also brings with it feelings of isolation and a burden of sole responsibility for the patient. Challenge of the clinical environment and by the attending tutors is welcomed but equally can be seen as exposing and stressful and creating enhanced self-vulnerability. In fact in my study, the situations in which students appeared least taxed by working together was not when they were working to a common goal, but when they were working on aligned projects that, when shared, could lead to increased or complimented understanding by all parties.

Clinical tutors are considered highly influential in the clinical environment and can make or break the students' interaction with the patient. Tutors earn respect for both their particular expertise and the way in which they handle the learning encounter. Students are motivated to learn through being inspired by their tutors who promote autonomous behaviour and arouse a sense of curiosity in them. Students can respond positively to the responsibility of autonomy that is afforded them, but negatively to the kinds of restriction that being too tightly managed brings to the experience.

Effective clinical tutors appreciate that students may have past knowledge and understanding of anatomy and its application. But care needs to be taken when a tutor uses his or her own personal understandings of anatomy not particularly shared by other people in the profession. I refer to Richard's freeze when asked what the *kicking muscle* was, mentioned in the findings for employing patterns of behaviour (section 4.32). In the context in which it was said, the kicking muscle was a football analogy with which Richard was totally unfamiliar. But this was an isolated case. Tutors offer clinical reassurance, act as professional role models, and display attributes of trustworthiness, wisdom and approachability. Tutors also bring clarity to the subject of anatomy and its application in clinical practice.

Dissection in the context of this study has been discussed in (de)construction of anatomy (section 5.13) and reality for or from practice (section 5.14) and will not be addressed again here. Printed materials and electronic devices are other means by which students learn with resources, and through and with others. All students use books to a lesser or greater extent to learn a subject, but anatomy books seem particularly important. Perhaps this is as a result of the need to visualise anatomy detail to memorise it, recall it, and apply it effectively in practice. Books can offer the student a link between the classroom image in two dimensions, and the reality of the patient in three dimensions. Portable devices which display appropriate Apps are a more recent invention and supply students and clinicians with an instant and accessible subject reference text. But books and Apps can differ in both their presentation of anatomy and their agreement of locations and insertions of structural parts. This can be very confusing for a student who is searching for the truth and can only find debate and controversy.

5.17 Recognising (in)competence in self and others

The recognition of competence in tutors would appear to be an earned status and a role modelling initiative whereby students measure themselves against the standards of the clinicians they consider to be experts. Learning to apply anatomy is experienced as a journey using cognition, skills acquisition and behaviour modification, and recognising their own competence and incompetence is a deeply reflective enterprise and a habitual part of students' everyday lifeworld.

Musculoskeletal clinical tutors are considered expert when students differentiate them from the usual tutors of the general medical podiatric clinics as knowing anatomy and using it effectively to diagnose complex musculoskeletal conditions. They hold themselves up to these experts' scrutiny to judge their own knowledge, skills and attitudes. They can feel a little intimidated by these experienced others, and face emersion into the musculoskeletal clinical environment to either disappoint or flourish: the former because they have simply replicated and repeated, and the latter because they selected and applied appropriately, anatomical skills and knowledge. This could lead to a confirmation (or not) of their learning.

The issue would appear to be over whether they perceive themselves as a novice, a reasonably mature clinician with acknowledged limitations, or an experienced learner who finds meaning in the significance of the situation. This fluctuates according to the clinic type (general or musculoskeletal), the context of the patient (age, medical health, presenting

complaint), the area of anatomy in question (foot, knee, hip and spine), and the confidence with which students operate. However, do all podiatrists need to be competent in all areas of anatomical podiatry to be effective clinicians overall? Where do clinical development and the capability to know when to refer on become apparent? Perhaps the question is more about the difference between what a general podiatrist does, and when the musculoskeletal specialist comes into play in the podiatric arena. Maybe if a clinician is the former, then a basic understanding of anatomy but a deeper understanding of pathology is important, whereas deeper anatomical knowledge is required if one is to specialize in treating disorders of the musculoskeletal system.

The findings have illuminated a journey students take through the classroom learning of anatomy to its application. As discussed in the constituent part a sense of reality for or from practice (section 5.14), anatomy needs to be real and have a place in students' lifeworlds. The timing is important here. If the learning episode is a new skill then application in the clinic needs to be carried out as soon as possible for the student to convert the repetitive practice into an understood and applied clinical dexterity. If the learning is of theory, then a short time needs to elapse to allow the new knowledge to be processed and contextualised in relation to all other aspects of the course. Once this is accomplished, application to a patient can be rendered real and relevant and new understandings emerge. This is experienced as professional development. However there are times when students can feel they are taking a step backwards. For instance, if the equipment they learn with is different to that available in the clinic on the occasion they are to apply it to practice, then there is a mismatch between practise and skill application. If too much time elapses between learning the skill and using it for some patient assessment, understanding may be lost and the learning will need to take place again. Equally, if students learn something on an adult but they are treating a child with the same condition, their lack of experience can make them return to their theoretical knowledge and they may struggle to see the effective application in this new circumstance.

It appears that learning anatomy in the classroom is one thing, but its application to practice involves a quite different way of seeing anatomy: of the visual conversion of the two dimensional into three; of utilising cadavers as multi-sensual learning tools or more as a means to see pathology; as a text book exercise or as a real patient encounter; and as a means to make connections between all the parts of the body in culmination. In other words, the whole is the sum of its parts, and the parts make up the whole (section 5.13).

5.18 Reflecting and acting on experience

Reflection can be experienced through a reflection on learning, clinical reflection in the applied setting, and a deeper and more personal critical reflection. These are all legitimate ways to reflect but with different foci, and although largely for discrete purposes, they also have an interconnection. In the anatomy classroom students are encouraged to think about their lives reflectively and consider what and how they learn anatomy through their past education and the current course modules. Through clinic they are encouraged to reflect on their anatomy knowledge and application in practice, and be deeply critical in their examination of themselves, their patient care and the premise on which their attitudes and values are based.

Reflection starts with an awareness that one is reflecting, the purpose of which is to bring about change for the better. Initially, students recognise the need to find time and space to think about their learning. They then reflect on what they see, and capture it in their minds in order to revisit and add to it at a later date. This awareness awakens the realisation that they are reflective people but that it now has a name, theory to support it, and empowers action to find appropriate alterations to cognition, skills and behaviour. By asking themselves reflective questions, challenging them to see anatomy differently and being responsible for real people in genuine clinical situations, students look inwardly and initiate tangible change in themselves and their practice. But these amendments to self also expose a responsibility to acknowledge their limits, correct their errors and develop their practice both autonomously and as part of a wider medical team.

Reflection is also a coping mechanism. By posing themselves problem based questions, students find relevance and meaning in anatomy and use it more effectively in clinical practice. Their concrete experiences test and challenge them and help them recognise when learning had yet to be achieved. This may be an undermining experience, but out of adversity often comes opportunity and students recognise that learning frequently comes from negative occurrences. It may also be an illumination of learning.

The findings (reflecting and acting on experience, section 4.38) presented how the students of this study already held and developed these reflective skills and it offered many examples of when students made time for reflection, put reflection into practice, and appreciated how they had changed as people and as practitioners through habitual and critical reflection. Susie classed it as a *reflective life*, one that she had brought to podiatry from nursing, but then so too had Janice from her work with people with learning difficulties. Richard had come from

Law, a career based in fact and evidence and therefore far less reflective in nature, but he also displayed strong traits of having led a reflective life.

The aim of my study has been to enlarge and deepen the understanding of the phenomenon of learning and applying anatomy, and I have provided insights into the lived experience of the phenomenon in the classroom and in clinical practice. But it is important to ground the findings in literature and determine which can be corroborated and which offer a new perspective on the subject. In examining my findings in this way, I am contributing to and expanding the discussion regarding how students of podiatry, medicine and other healthcare professions learn and use anatomy for effective clinical practice.

5.2 Constituents of Learning and Applying Anatomy and their Relationship to the Current Literature

The structure of the phenomenon given in section 4.2 is representative of an overriding story that gives unity and wholeness to the events of the phenomenon. In this study there were eight constituent parts. In the subsequent sub-sections of this chapter, the character of each part will be examined for its comparison with and/or deviation from existing current literature, both phenomenological and other. There is an abundance of overlap between constituent parts and it is not possible to cover every aspect for every part without frequent repetition. Therefore only the main characteristics of the constituent part will be presented. Shared aspects will be reserved for the constituent where it features more prominently.

5.21 Assuming a learner-ready attitude

Assuming a learner-ready attitude meant several things in the context of this study. It was about anatomy as a complex subject, understanding ones' own learning preferences and being ready to take the subject on board, being in the right frame of mind to set about learning, and the promotion of professional values through the use of anatomy in practice.

Assuming a learner ready attitude involved a motivation to learn. Anatomy is perceived as a complex and difficult subject to learn characterised by a vast amount of information and detail to be memorised, stored and later recalled. Extensive literature on learning anatomy also states this to be the case (Miller et al., 2002, Pandey and Zimitat, 2007 , Netterstrøm and Kayser, 2008, Wilhelmsson et al., 2010, Wilhelmsson et al., 2011, Bergman, 2015). Learning and applying anatomy was described as constant revision that had to be done habitually, a finding corroborated by Bergman et al. (2013a). Analogies and metaphors were used to explain students' perception of anatomy, findings in agreement with Öhrling and

Hallberg (2000a) and exploited by authors such as Çolak et al. (2016) and Aktekin and Aktekin (2011), and also mnemonics as corroborated by Wilhelmsson et al. (2010). Motivation, however, was a challenge to maintain due to the nature of anatomy as a subject and the ways in which students believed they had to grasp it (Böckers et al., 2014). However, if the subject was experienced as too difficult, then students can give up looking for understanding. Researchers who also found this were Weurlander et al. (2016) whose participants gave up when they perceived the subject as too hard, Bergman's (2013a) participants who reported that the expectation to learn so much detail was demotivating, and Fitzgerald et al. (2008) whose participants experienced the cramming of detail led to a mental overload.

The study methods students take to learn anatomy speaks to “what an approach to learning is for a student within their own lifeworld” (Greasley and Ashworth, 2007). In other words, what their understanding and inclination towards the object of their learning is, and how they manage the situation in which that learning is taking place. Comparisons for the students of this study and their ways of approaching the subject can be drawn with several of the named subjects of Greasley and Ashworth (2007): Gary, Clive, Diane and Karen. For instance Susie was similar in her approach to learning anatomy as Gary in that they both adopted attitudes of avoidance to cope with the complexity of the subject, saw texts as the enemy and an academic endeavour, and classed themselves as poor achievers which they considered disappointing and frustrating. Richard aligned more closely with Clive and found learning an exercise in self-development and identity enhancement and could view the world more critically once understanding had been established. And Janice and Karen were closely allied. They were aware of others and their learning needs but at times their own personal learning space was preferable, validation by experts was welcomed and appreciated, and optimal learning would best occur in the clinical arena. There were features of Diane's approach (Greasley and Ashworth, 2007) to studying that were affiliated with all three of my students. Susie and Diane both wanted *to do* something with their internalized material to learn in action. Janice and Diane wanted to incorporate a variety of others' perspectives into their learning, and to challenge and be challenged by others to enhance it. Richard and Diane both sought personal meaning of the material to be learnt to reach understanding, and challenge their own assumptions to develop professionally. It is interesting that Greasley and Ashworth classed Diane's approach to learning as ambiguous and often conflicting, and would seem to explain why there was a little of all three of my students in her.

Being learner-ready was also promoted through the gathering of knowledge. Learning takes place from theory to practice, or from the patient to theory, and some students are able to learn in either direction. The theory to practice way of knowing is a gathering of new knowledge, adding it to existing and past knowledge, discovering new perspectives and moving forwards. This is aligned to the “structured and built” approach to knowledge, as described by Wilhelmsson et al. (2011, p.162). Weurlander et al. (2016) and Jensen and Lahn (2005) also discussed learning as a forward and reverse concept. They discussed understanding as the dynamic relationship between a process and a product. The process was through a gathering of bits of information, and the product was the interconnectedness of those pieces into a single entity. For some students of podiatry, this is a gradual progression and students need to learn facts and concepts in the classroom before trying to assimilate them and use them in the clinical context. However, Weurlander et al. (2016) went on to discuss how their participants then used that understanding in clinical practice and found, in contrast, that the students considered their knowledge from the end point of diagnosis, to the theoretical beginning of the anatomical details. Other students assume a learner-ready attitude by tackling anatomy differently; from the bigger picture to the anatomical smaller one. Arguably they will be less proficient at this application though, as they have often failed to acquire the knowledge at the time it is facilitated. For these students, contextualization is missing from their early learning experiences. They need the connection between anatomy and its clinical manifestations to make the subject meaningful and motivating. This was also reported by Bergman et al. (2013a). In podiatry particularly, some students may grasp the anatomy of vascular and neurological disease more quickly, but do not encounter that depth of learning in musculoskeletal anatomy until later in their podiatric education. It is possible that this is why sudden moments of clarity, those experiences when aspects of knowledge suddenly reveal themselves and a new understanding is created, can occur at this late stage in the education. Students suddenly make sense of anatomy practice because the reason for a certain feature has brought about an understanding previously illusive. I was a nurse prior to studying and becoming a podiatrist, and I experienced several of these moments. They were usually at times when I was having a pathology explained to me, I would remember something from my nursing past, from patients that I have cared for, and the proverbial penny would drop. Weurlander et al. (2016) also described these illuminations, or periods of insight, that occur suddenly and give a student a sense of deep satisfaction.

Being learner-ready was also about being in the mindset, or having preparedness for the learning that is to be undertaken. Students described their preparation for both theoretical and clinical learning, demonstrating their independent thought and self-direction, to gain the

most of the opportunities presented. Windsor (1987), in a study about nursing students' perceptions of clinical experience, discussed this finding as an act of being motivated to learn effectively; both in quality and in quantity.

The final aspect of assuming a learner-ready attitude revealed in this study was through the development of professional values. Students feel a responsibility to learn anatomy so that they can apply it to be as thorough in patient assessment as they were capable, do as much for the patient as they are able, and not be diminished as a learner in their patients' eyes. These findings are borne out by Bergman et al. (2013a), and Jenson and Lahn (2005). Both studies investigated participants' motivating factors to gain knowledge of anatomy and understanding in the clinical arena and found that participants felt responsible to learn through real patient contact and to not appear unprepared or inept. Fillmore et al. (2014) found a similar sense of responsibility to learn but in the dissection room, and as an incentive to gain understanding for the future care of patients. A finding in my study was that students who were afforded a certain degree of autonomy in practice respond positively and had a greater motivation to learn. This finding was also found in Chapman et al. (2017). Finally, in my study a deep respect and trust was found between students and patients, an aspect also reported by Jensen and Lahn (2005).

5.22 Employing patterns of behaviour

Students display individual behaviours when approaching learning and applying anatomy to real patient situations. This was an opinion held by Weurlander et al. (2016, p.473) who stated that students "also learn appropriate ways of thinking and practising in the discipline". However, in both my study and that of Weurlander et al. (2016), these behaviours worked well, or less so, depending on the context of the experiences.

Some students learn through concrete experiences. Such *inductive* learning happens from the experience of real cases, students then finding the information that would help solve their clinical problem. Other students learn by *elaboration* (van Merriënboer, 2016) whereby when they gain new information they look for a cognitive structure that might help them understand it in general terms, before assimilating it with their existing knowledge. An example of this lay with Richard. He learnt about muscles in the classroom and then saw them in a cadaver. When he was presented with a patient who was not walking with such precision, he structured this new knowledge into an analogy of an orchestra. He likened each muscle to an instrument of the orchestra, which was in itself small and not particularly significant but once employed with the rest of the muscles, would bring about intricate and

controlled movement. Richard was then able to come to an understanding of how a small, seemingly insignificant muscle which was malfunctioning could contribute to but also distort normal body movement. Therefore a new understanding had formed and he understood why the patient was not walking in their usual way. Both strategies of learning, inductive and elaboration, requires conscious processing, and each students' pattern of behaviour helps them with this. Once they establish a way of conducting themselves in clinic, this behaviour becomes automatic. In so being, it allows for the freeing up of working memory capacity for those other activities that can tax the student and which can greatly improve performance (van Merriënboer, 2016)

Further to inductive and elaborative learning, van Merrienboer (2016) discussed *complex learning*. This is an integration of cognition, skills and attitudes for the purpose of transfer. Transfer occurs when students are faced with unfamiliar problems and they are required to apply their past knowledge and experience to solve them (Norman, 2009). Students' developed patterns of behaviour allow them to perform routine tasks without effort, releasing them to apply their cognition, skills and attitudes to other more difficult areas of practice with their patient. The theories of inductive, elaborative and complex aspects of learning help to explain why students develop patterns of behaviour in learning and applying anatomy, and this contributes to the literature. No published papers were found which discussed these types of learning in the context of anatomy.

To add to the complexity of a complex learning situation, anatomy is largely accessed using two dimensional resources. Students read texts and other books to help them gain some understanding of anatomical components in terms of their place and position in the limb and their size. The skill is to translate these two dimensional images into three dimensional body parts. This is known as spatial imaging and is also discussed as a necessity for medical students by Wilhelmsson et al. (2010, 2011) and Miller et al. (2002). Vorstenbosch et al. (2016, p.8) advocated that "anatomy teachers should focus the students' learning activity on building an adequate visual representation of anatomical structures". Students can find the cadaver a useful step from book to patient, experiencing it as a tactile encounter that helps them visualise the anatomy beneath the skin of the patient in front of them, and palpate the anatomical parts to compare the patient's with the comparative anatomy of the cadaver. This is not an easy concept to grasp, and it was only once they achieve it that students can reach understanding.

Students are not always aware of their competence, or indeed incompetence, and this can manifest in a fear of failure or of being exposed for lack of knowledge. This can be examined

from the work of Noel Burch and his model 'The Four Stages of Competence' (Braun and Chaczko, 2015). When students first encounter anatomy they are 'unconsciously incompetent', meaning that they have little or no notion of what it entails and are therefore unaware of what they do not know. As they start to learn anatomy and assimilate new knowledge with their past understandings they become aware of what they do not know and are therefore 'consciously incompetent'. As they learn and use anatomy in practice and become more familiar with it as a diagnostic and communication tool, students become 'consciously competent', in that they are competent in many aspects of applying anatomy but the experience takes a lot of mental effort. This study has not identified that my students have reached the final stage of 'unconsciously competent' as this an intuitive state and is how expertise is judged. However, learning and applying anatomy is highly contextual and it is possible that students can reach this level in some aspects of clinical practice, and not others. The findings from my data, and my added observations of clinical practice, revealed that Janice and Richard had reached the stage of consciously competent and were able to apply anatomy safely and effectively. Susie was at this stage for vascular and neurological anatomy, which she applied very comfortably in the general clinic, but was at the stage of consciously incompetent for musculoskeletal anatomy. This model is an appropriate way to view my findings and captures the complex nature of learning a subject and attempting to put it into practice in a professional setting. No mention of it as a concept applied to medicine or anatomy was found in the literature.

5.23 (De)constructing anatomy

This constituent part was characterized by students either breaking anatomy down to its structural parts then rebuilding it in their mind, or by taking a big picture view and seeing the whole. The challenge is to visualize the anatomy of a real person, grasp the anatomical language, and to understand the application of parts and wholes in practice.

Anatomical detail can be accessed through dissection. Students are able to give meaning to the parts through identifying size, shape, anatomical position, relations with other parts, and to get an overall sense of place in the limb. It is a multi-sensual experience and some students consider it an imperative for their learning. It is not without its psychological impact, however, leaving impressions of unpleasantness as detailed by Weir and Carline (1997), and a detached concern, highlighted by Tseng and Lin (2016). Although the literature is divided on this particular topic, Wilhelmsson et al. (2010, 2011), Granger (2004) and Evans and Watt (2005) advocated dissection as a valuable anatomy learning resource. For Wilhelmsson et al. (2010, 2011) and Granger (2004) the issue was that students could see the big picture by

learning through the visual and tactile experience of utilizing time in the anatomy room for dissection and prosection. Indeed their participants considered these more important to them than technology such as virtual Apps as it helped them bring anatomy closer to reality. None of these studies discussed the negative aspects of dissection, or that students might not gain anything from it. Evans and Watt (2005) reported on how anatomy room experiences could be integrated throughout their medical students' course, bringing the students back into dissection in their clinical rotation years. The outcome was that the students could reassemble the known facts of the parts into a single whole, concentrating on specific anatomical areas, for a more effective use of knowledge in the clinical arena. Some students gain more from dissection earlier in the course than others, but it appears to be quite a technical encounter. It is only later in their education that they benefit most from re-entering the dissection room by being able to explore more and to inspect the presenting pathologies (hardened arteries, joint arthritis) of the cadavers. They find this connects them directly to the reality of the patient and feel inspired. This was also reported in Evans and Watt (2005). There are many who would argue against the need for cadavers to learn anatomy, not least of which is McLachlan and Regan De Bere (2004) who claimed that this depth of anatomy was unnecessary for allied health professionals and that they did not need such advanced knowledge of anatomy to achieve their learning requirements. I disagree with this finding for students of podiatry. I am aware that not all schools of podiatry use dissection in their curricula, and my assumption is that their students do learn anatomy to a sufficient level, however I believe dissection deepens a students' learning experience and thereby their understanding of reality, and helps them communicate with patients about normal and pathological anatomy far more effectively.

A further aspect of (de)constructing anatomy was that of the language of anatomy. The subjects in the Netterstrøm and Kayser (2008, p.157) study were proud of learning the new language and felt it was part of becoming and belonging to a professional group. This was an unusual discovery however, as most studies' findings were that anatomy language was complicated, hard to penetrate, and an obstacle to grasping the subject (Miller et al., 2002, Wilhelmsson et al., 2010, Weurlander et al., 2016). Their participants, as did my study students, found the language of anatomy much like learning a foreign language and they resorted to rote learning and memorizing. Although this propositional knowledge may be helpful to a student, it is how they use it in professional practice that is more important (McLachlan et al., 2004). What is also important is that the aim of that memorization should be leading to the understanding of anatomical concepts and for communication in clinical practice (Miller et al., 2002, Bergman et al., 2013a, Vorstenbosch et al., 2016). My findings

suggest that some students advance from learning disparate names and terms to communicating anatomy comfortably in clinical practice with tutors, colleagues and patients. They progress from experiencing anatomy language as foreign, to being bilingual, also borne out by my observations of my students in practice. Wilhelmsson et al. (2010, 2011) also found this. Their first year students of 2010 treated anatomy as a foreign language, whilst their fourth years in 2011 had progressed to using it as a mother tongue. Their students now saw anatomy as a connection of features and a means to visualize the anatomy of their patients. One message here may come from Chapman et al. (2017) whose paper focused on the role of language in the teaching of anatomy. They advocated making more effort to teach vocabulary through its use in the curriculum content, rather than focusing on vocabulary before interacting with the content. In this way students were enabled to contextualize the content of anatomy more meaningfully. This may be my notion of Susie's 'conversational anatomy': for her to use it in context, and not try to master semantics first.

McHanwell (2015), Siddiqi et al. (2014), Bergman et al. (2008) and Evans and Watt (2005) advocated integrating anatomy across all the undergraduate years, such as in a spiral curriculum. My findings support this strategy. The spiral curriculum was first discussed by Jerome Bruner in 1960 (Kabara, 1972, Harden, 1999), and is when topics are taught on multiple occasions across a course, each time building the learning events on one another and deepen understanding. This approach can enable students to draw on past learning, reinforce the knowledge of parts and wholes, and advance it to make new meanings. Consequently they should gain in confidence and the ability to apply anatomy to practice (Bergman 2013).

I have introduced the idea that anatomy and its use is like a jigsaw puzzle. By breaking anatomy down into its constituent parts, students itemize the pieces to memorize and recall them later. They know that the care of the patient is their ultimate goal and that the wholeness of the body is more important. This is supported by Wilhelmsson et al. (2010, p.158) who found the same thing of their participants, who were all trying to make sense of the whole by their examination of the parts, make a three dimensional picture, and "see how it all fits together". This was bringing them to understanding. This is equally valid for those students who see the whole before focusing on the necessary part. Interestingly, Martin et al. (2014) felt that this was a preferable way round for their students of speech and language pathology. However, this approach could not be easily explained in terms of pure anatomy. Students who learn in this manner subsume anatomy into all the other elements of clinical practice (physiology, pathology, pharmacology and so on) and anatomy knowledge and

understanding as an entity cannot be determined. This may be acceptable for general podiatric practice where more conservative care is delivered, but for musculoskeletal practice which entails intervention and possible anatomy manipulation, clinicians have to use anatomy more overtly. The understanding of individualised structure and specific function therefore becomes a much more important facet to treating the whole.

The key here is understanding. As discussed by Wilhelmsson et al. (2011), understanding implies the students have made a connection and coherence of their construction of anatomy and have rendered it meaningful. Some students find that by connecting anatomy to pathophysiology and other functions of the body, they can appreciate cause and effect, known as causal logic. This reveals the relevance of anatomy to these students and they can see its place in podiatric care. Other students operate with a different kind of reasoning. For them, anatomy is an entity to be understood and then selectively applied in practice according to the patient and the situation in which they find themselves. They are working with clinical reasoning and making clinical decisions based on a final logic (Wilhelmsson et al., 2011).

5.24 A sense of reality for or from practice

For many students, anatomy and its application only makes sense once they are using it in real clinical situations. This can be empowering for the students, which increases in magnitude as their experiences in clinical practice mount over the progression of the course.

To enable students to feel anatomy is relevant to motivate and empower them is not a new concept. Kember et al. (2008), Bergman et al. (2013a), Böckers et al. (2014), Martin et al. (2014), Pawlina and Drake (2016) and many other authors advocate the critical importance of helping students learn anatomy through authentic situations, the best of which is in the care of real clients. The students of my study saw patients from year one semester two, the semester following their anatomy classroom learning, so were able to use their learning of theory relatively soon after their initial contact with the content. However, the premise on which my research has been based is that they are unable to do this very successfully, and I wished to examine why. The study of cadavers helps some students learn anatomy and they make a successful transition from knowledge to understanding. But just as for some participants of Weurlander et al. (2016), anatomy as a subject can be experienced as chaotic, lacking orientation and without the sense of an overall picture. This can cause confusion and a sense of dissatisfaction that students cannot make meaning (Wilhelmsson et al., 2010). They may therefore approach anatomy theory with the intention of memorizing facts and

terms. This is not the ideal. This study has exposed a need for change in the teaching of anatomy theory so that students are empowered to make more sense of the content and see its relevance for their future clinical practice.

So how can this be done and how might this empower students to achieve competence in their use of anatomy? In the literature review I discussed Gregory et al. (2009) and their successful restructure of the delivery of their anatomy course to use dissection, medical imaging, and the practise of physical examination skills on peers. In my classroom the students already experience cadavers through prosection and dissection, and they learn anatomical features and practise manipulation of foot joints on each other to bring them to an understanding of the foot in stasis and later in function. The former is with limited success, and the latter facilitates them to pass a test. But students can still struggle with application to patients. It is possible to use pictures from medical imaging as a teaching tool, as this can facilitate the translation of the two dimensional image into three dimensions. Also the introduction of case studies, the use of podiatric medical and surgical 'stories' to illustrate when anatomy was used in practice, and the design of learning encounters with cadavers that give students specific outcomes to achieve, can help teachers improve student learning and understanding. In enabling them to see relevance, steeping learning in clinical practice, and directing their learning away from terminology and towards concepts of anatomy, they can be empowered to anatomical competence at an earlier stage in their student careers.

McGaghie and Kritopaitis (in Cleland and Durning, 2015) have written about Deliberate Practice, a competency-based education in medical education which has shown potential to improve outcomes for patients. The aim is to achieve competence, and then mastery, in the practical acquisition of clinical skills through clear goals, focused repetition, immediate outcome measures that provide quality feedback, refinement of skill and then evaluation. At some level, this type of concentrated practise may help podiatry students learn anatomy, develop and refine the practical assessment of the foot, with the consequence of reaching success and satisfaction in their achievement. This has the potential to fix the skills in their memories and permit them to recall them when needed once they enter the clinical domain. This would align with the memory storage of elaborate learning discussed in the patterns of behaviour, and with the skills aspect of Merriënboer's (2016) complex learning (section 5.22).

If a student improves their theoretical learning and increases their practise of clinical skills to a competent level, then they can be empowered to experience appropriate levels of confidence in the clinical setting. The notion here is of familiarity. Although professional

confidence is multifactorial (Holland et al., 2012), if students can achieve a healthy level of confidence then it has the potential to improve the effective care of patients (Öhrling and Hallberg, 2000a, Fillmore et al., 2014, Martin et al., 2014). Bergman et al. (2013a) reported that as their participants progressed through the course, they increased in independence and they had to rely on their own anatomical knowledge to a greater extent. They found this empowering and giving them confidence that they could tackle any anatomical problem. Podiatry students can reach this level of confidence and then add new and deeper knowledge to their anatomy use every clinical session. Chesser-Smyth (2005) also found this outcome; that the continual acquisition of knowledge inspired confidence in their participant's ability to carry out more complex nursing duties. Lack of confidence can have equal influence but in the negative. Students can experience this as frustration, a lack of engagement, and can frequently question their own judgement, findings also in Martin et al. (2014). My belief is that some students are too concerned with the terminology of anatomy than with the actual purpose of it. Once they come to the realization that terminology is merely words and that communication of anatomy can happen in other ways, a proposition supported by Miller et al. (2002), they might settled down with anatomy and see their way to confidence.

5.25 Solving clinical problems

Clinical problem solving is an important part of how students experience the application of anatomy. As has been previously discussed (section 2.42), the participants of the Weurlander et al. (2016) study used pathology knowledge and understanding in clinical practice from the diagnosis to the symptoms; a problem solving approach. Students of anatomy tackle clinical problem solving in a similar way.

Students see patients as unfamiliar and complex problems (van Merriënboer, 2016), requiring an integration and assimilation of cognition, skills and attitudes to solve them. These three aspects of learning correspond with the conceptual, skills and affective domains discussed by Koens et al. (2005) (section 2.11). In the conceptual domain, the students use their *roadmap* of the body to make sense of the situation by applying theory to practice, or by seeing the consequence of pathology and working towards anatomy. They use their practical skills as frequently as required and are either already adept, or requiring more practise. The affective domain is their attitude towards the learning encounter and this is largely of being learner-ready and taking on patterns of behaviour to facilitate their solving of clinical problems. These domains are all meaningful contexts, and enables students to apply anatomy more readily in the practice setting to solve clinical problems.

Illuminated in my research has been the concept that anatomy is used as a tool, or as an object. Its use as a tool aligns with Wilhelmsson et al. (2010). Their participants provided effective clinical care by using anatomy as a tool to locate symptoms of pain and pathology. However, later in their study, and as their medical participants became more experienced, that notion of anatomy as a tool became contextualized with medical practice as an entity and they started to see the objective patient. My study has also found this. Some students of anatomy are motivated by the medical aspects of the patient; their general, surgical, social and pharmacological health and anatomy becomes subsumed. Miller et al. (2002, p.75) said “anatomy is a basis for logic and reasoning, and problem solving”. Susie represents the problem solver who works with inductive reasoning, and is *logical*. I described this as someone who examines patient problems like the approach to a crime scene. Janice and Richard represent the ‘scaffolders’ of deductive reasoning; students who built up knowledge and understanding from early classroom encounters, through dissection, and finally to the clinical environment.

One theory in cognitive psychology hypothesizes that students make clinical decisions by processing information in two ways: as intuitive and automatic, and as analytical and evaluative (Malterud, 2001). This can be considered through Dual Process Theory (Bate et al., 2012). Dual Process Theory has been adopted by several theorists as a means to assert how people process information and use it in various contexts, and more recently by Daniel Kahneman who adapted it to develop the dual process theory of system one and system two (Kahneman, 2003). System one is largely tacit, performed relatively quickly and does not need a great deal of effort. As applied to medicine, practitioners develop patterns, or illness scripts (Schmidt and Rikers, 2007, Pelaccia et al., 2011), for identifying collections of signs and symptoms, often using mental maps and with clinical guidelines as references. These are generally developed through education, experience and repetition (Malterud, 2001). Eraut (1994) argued that as doctors practice their field of medicine, this unconscious competence is what sets them apart from newer graduates. Students of anatomy construct enough understanding of the subject, and the ability to apply it effectively, to more simple anatomy cases and to medical cases. They do this through mental maps, patterns of behaviour and internal systems, enabling them to make suitable clinical choices reasonably quickly. They are using ‘system one’ reasoning and are consciously competent (Kahneman, 2003) (discussed in section 5.22). System two needs to be employed for more complex cases. System two necessitates a careful and detailed consideration of the case, utilizing theory and evidence to consider the patient, taking more time and effort to come to a diagnosis and management plan. Students of anatomy, when faced with situations in which they have less

knowledge and experience are much more careful with the questions they ask, the tests and skills they perform, and the diagnoses they formulate. They draw on their prior and present understandings and discuss their findings with tutors. This is system two processing and is in the domain of consciously incompetent (section 5.22). In my study and through my observations, I watched my three students wrestle with themselves about which were the appropriate tests to carry out, hesitate as they tried to plan their next move, and communicate with their tutors about which were the best assessment methods, the interpretation of the results they had obtained, and what was the most likely diagnosis. Pelaccia et al. (2011) wrote an extensive discussion on Dual Process Theory as a method by which to examine how doctors made clinical decisions and concluded that there was much to be learned from viewing clinical decision making in this way. Eraut (1994) argued that doctors have sufficient knowledge of diseases and their symptoms by graduation, but competence comes in organizing that knowledge better and having it to hand more readily. I have found this an interesting way to view my findings. In the musculoskeletal clinics the students all worked largely in system two having to analyze and evaluate most of what they did to solve their clinical problems. They were developing their knowledge but it was not yet complete. In the general clinics however, they were much more intuitive and made decisions and judgments far more instinctively. They had become well educated in podiatric medicine and spoke of, and were observed as consciously competent (Eraut, 1994, Braun and Chaczko, 2015).

The findings of my study suggest that podiatry students can take a pure problem based approach to learning and applying anatomy. They see the patient through a holistic lens, work through the problem until the cause reveals itself and they then consider the anatomy if appropriate. I have detailed (section 1.2 & 1.613) that our current podiatry curriculum, being case led and case based, is not a problem based learning (PBL) curriculum but a traditional, medical model approach. I now question whether this is the best design for the students who learn in the problem-based paradigm. However, the literature would not seem to support my doubt. In medical education, researchers found no evidence to substantiate the claim that their problem based learning approach to education was superior to the more traditional classroom approach for the learning and teaching of anatomy (Prince et al., 2003, Chakravarty et al., 2005, Nayak et al., 2006). Further, two meta-analyses on the subject of problem-based learning versus traditional teaching approach found no difference in students' competence or knowledge of anatomy in medicine (Colliver, 2000, Newman, 2003). Weurlander et al. (2016) suggested that students on a PBL curriculum may have the same difficulties in learning anatomy as those on a traditional course. Bergman et al. (2013a) stated that PBL does not offer enough incentive to study anatomy, and that students can

equally sift out the anatomical learning objectives and concentrate on the more medical aspects of the cases under scrutiny. They concluded that the more effective aspect of the course was the relevance brought to the subject, and the application of it in applied situations. Problem based learning is a student centred approach which relies heavily on student autonomy and self-reliance to discover answers to multi-factorial questions. My findings have established that some students are not internally motivated to learn anatomy and they need direction from others to be stimulated and motivated. I can therefore draw no conclusion as to the more effective way to teach anatomy to healthcare students.

5.26 Working alone, with resources, and through and with others

Developing understanding can be an individual endeavour, but generally students need to engage with others, and with learning resources, to make meaning of the subject and experiences in which they use the knowledge.

The literature on multidisciplinary learning is extensive, and includes Mitchell et al. (2004) and Martin et al. (2014) who both discussed the pros and cons of interprofessional education in the teaching of anatomy. Weurlander et al. (2016) very briefly mentioned that students of the same discipline learning together can help them solve classroom and clinical problems. However, this literature does not help me explain my findings; that students like working with each other if it is to complement each other's knowledge, and not if it is merely to work towards a common goal. Podiatry students find shared learning an acutely uncomfortable experience where they measure themselves against others and are either disturbed by feeling inferior, or embarrassed by their enhanced knowledge. Fillmore et al. (2014) discussed the power relationships that exist in the dissection room, with some individuals seeking dominance over others and the group dynamics influencing learning. Certainly there was a feeling in my study students that some of their peers would take control of the activity or discussion being conducted and this would destabilise the learning environment.

The relationship with tutors featured very strongly in my findings. This was also the centre of research by Öhrling and Hallberg (2000a, 2000b), Gillespie (2002) and a finding of research by Papp et al. (2003) and Windsor (1987). My findings demonstrate that students respect their tutors for their knowledge and expertise, and their skill of teaching. The students trust them to do the best for the patient but also for the student. They find tutors are an inspiration, and this motivates them to learn and apply more anatomy. They also appreciate the degree of autonomy the tutor affords them in the clinical setting. In addition, students can appreciate and respond positively to being challenged by the tutors. Gillespie (2002)

examined the connection between the tutor and student in clinical nurse education. Firstly, she found an egalitarian relationship; that even though the participant had less professional knowledge, they were still respected as equals with the tutor on a personal level. This supported participants by helping them feel at ease, valued as people and the experience of a “positive self-regard” (Gillespie, 2002, p.569). The result was a clinical experience which was safe and supportive. Secondly, Gillespie found that competence can be achieved through a ‘mutual knowing’. On one side, the participants were interested in knowing their tutors as people and not just as professionals, so they could relate to the tutor as a person and they would feel comfortable to communicate effectively. On the other, the tutors were appreciated for knowing something of the participants’ backgrounds and to bring that previous knowledge, skill and experience to the situation. This motivated the participants and gave them a sense of self-worth and confidence. Thirdly, the effective tutors were those who could recognise the participants’ learning needs and identify the best methods of supporting them in that learning. Papp et al. (2003) also found that student nurses were influenced by the attitudes, values and behaviours their clinical tutors displayed in the clinical environment, and Gillespie (2002) discussed the notion of the tutor as helping students develop a professional identity. Windsor (1987) presented a finding that participants “learned more from knowledgeable instructors, but they did not want the instructor to do their work for them” (p.152) for fear of damaging the relationship and undermining their confidence. These findings support those of my study.

An equally important aspect to students’ independent learning of anatomy is through books, Apps and research. Some students read widely and extensively. They may like anatomy books that provide clear diagrams and parallels with the cadaver. Other students prefer models to help them grasp parts and wholes. Mobile Apps are also used occasionally too. Miller et al. (2002) suggested that learning was not as effective when undertaken using Apps as through the use of texts. Their issue was about anatomy variation. Books can demonstrate locations of structures and offer detail about the normal origins and insertions of muscles as they might appear in the majority of the population. ‘Normal’ is a complicated concept however, as there is a perhaps unexpectedly sizable variation in what is considered non-pathological. Texts can help explain the substantial variation that can occur in the human form (Cihak, 2013), and cadavers may present the students with the opportunity to see anomaly (Willan and Humpherson, 1999). Apps, however, are less responsive to these variants as they represent the most common structure of anatomy in the general population.

Students can take a skeptical view regarding clinical theories of biomechanics. They read them, largely understand them and recognize how they might be of benefit in clinical practice, but they stop short of following the theories rigidly. Some students use the theories as tools, and keep them at hand for reference purposes. This skepticism could be explained by Biesta (2007). Biesta states that clinical research evidence is only one factor in the process of clinical decision making. Research offers current best evidence to support a theory or practice in the care of patients of the discipline. Effective care, however, also involves drawing on past experience and using problem solving skills. Therefore, making the appropriate clinical decisions relies on research, but also on clinical expertise. This could explain why different practitioners of podiatry may manage equivalent clinical problems in several ways, all of them being effective but none of them being the same. They may all have read similar research papers, but will have personal ways of practice and diverse experiences to draw on. In my experience of past students, this is what is being referred to when they say they cannot find consensus about the best way to treat some conditions, and that practitioners all appear to have different opinions.

5.27 Recognising (in)competence in self and others

At the heart of this constituent part is the notion of expertise. Students hold themselves up to scrutiny, and measure themselves against those they deem competent and expert. They then judge that they are doing well, need to develop in certain areas, or have failed to reach their own acceptable standard of anatomy application and consequential delivery of care. To examine this, I will compare my findings to those of Benner (2001) who used the Model of Skill Acquisition of novice to expert (Dreyfus and Dreyfus, 1980) as applied to nursing.

Students of podiatry consider many of their tutors to be expert. They consider them as intuitive and operating clinical decision making from a deep understanding of the whole situation, and can find this inspiring. But Benner's experts have ceased to problem solve and make decisions by using analytical tools, and are generally unable to explain all that they know (Benner, 2001). I would argue that the expert tutors of my study were experts in practice, and the students recognised this in them. However, these tutors were also teachers, so they had to get back in touch with their analytical skills to be able to explain their thinking to students. This finding was also present in the phenomenological study by Weidman (2013) whose expert clinicians transitioning to being novice clinical educators also had to relearn this skill.

Successful advanced students of podiatry have moved through the novice and advanced beginner stage, to Benner's competent clinician. For this person, competence is effortful but achieved through being able to plan priorities and actions, organize their time, and manage the care effectively. In my study specifically, and through their narratives and my observations, I believe my students were largely at this stage in the musculoskeletal clinics. I say largely, as at times their lack of experience with the more complex patient would show them to be back into the advanced beginner stage. But Janice and Richard were quite comfortable now with anatomical problems and were working with clarity to their thinking and a plan in their minds. Susie fluctuated more, although I would offer that this was mainly to do with terminology usage rather than clinical skills and decision making prowess.

Benner's fourth category of the Model of Skill Acquisition was the proficient clinician. This clinician sees the whole picture, perceives the case as an entity in itself, operates in terms of long term planning, and only employs their analytical skills when the situation warrants it. It is possible that some year three students who practice problem-solving have reached this in the general clinic. When consulting with patients they look to the bigger picture and see the consequence for the patients. They then work towards resolving the podiatric problem by planning interventions that address the issue over time, and prevention strategies to inhibit its return. These students may not see the terminology of anatomy as the important issue, but its use in practice manifests itself in their skills and decisions. These particular students may not be proficient in all areas and at all times, but some areas and some of the time.

What Benner's model concentrates on though is the experience of the practitioners, their tacit knowledge and intuition (Benner, 2001). It does not take into account their use of theory or their grounding in the basic science. If this were the case I am not sure these problem-solving students would be perceived as so competent since they may lack knowledge from earlier course learning, such as texts, cadavers and other resources. Equally, those students who take a classroom to clinic approach may appear as more proficient than 'competent' would suggest. Eraut (1994) makes known that Benner's model neglects the aspect of self-behaviour management and self-evaluation. So experienced nurses may have been able to make choices and these become their standard intuitive practice, but they may be operating under a fallacy and have not analysed their actions for accuracy and rigor.

I believe my students' scrutiny of themselves is about their anatomical self-efficacy. Burgoon et al. (2012, p.249) defines this as "an individual's judgement of his or her ability to successfully complete tasks related to the anatomy curriculum". In Burgoon's study, this included dissection, learning anatomical concepts, and applying anatomical knowledge to

clinical problems, and their data was a comparison of anatomy assessment test scores and perceived self-efficacy ratings. My study situation is somewhat different as the application was in real clinical situations and over a period of three years, but there was one very useful parallel to draw. Burgoon found that those with higher self-efficacy took more control in dissection, performed the skills more often than their peers, and gained more experience. They were able to see more anatomical structures and understand their relations with neighbouring ones, and they gained dexterity skills with precision instruments. Janice and Richard were aligned to this and represent the students who have high anatomical self-efficacy. Dissection is experienced as engaging, a chance to see structures in detail, a measure of structure size and space, and a chance to encounter pathology.

Some students display a low anatomical self-efficacy. They are embarrassed by their lack of terminology, their perceived inability to apply anatomy to practice, and they may doubt many aspects of their anatomy based care. Bergman et al. (2013a) and Chesser-Smyth (2005) attributed these kinds of vulnerabilities to deficient knowledge. Interestingly, both studies reported these as a perceived knowledge shortage, rather than actual knowledge deficit. In Bergman et al. (2013a) the more senior medical student participants reported remembering how it was for them to feel knowledge-poor in their earlier years, but they were now able to forgive themselves for it acknowledging that it was as a result of their lack of experience. It was beyond the scope of my study to determine if it was a perceived, or an actual lack of knowledge diminishing some students' anatomical self-efficacy, or if it was due to some other personal or psychological barrier to learning, but it is worthy of note none-the-less.

Jensen and Lahn (2005) suggest that students connect emotionally differently to the subjects that they learn. In my study, Janice found anatomy unequivocal, Richard saw the brain as a vessel in which knowledge is stored for future recall, whilst Susie crammed in knowledge without meaning (Netterstrøm and Kayser, 2008). These are epistemological views of anatomy knowledge which can influence how students go about their study. Students with low self-efficacy might chose resources, activities and skills for which they believe themselves capable, and avoid those in which they feel insecure (Burgoon et al., 2012). They might also choose career paths in this vein. Fitzgerald et al. (2008) investigated the career intentions of 208 newly graduated doctors and correlated them with how satisfied they were with the anatomy teaching they received at the medical school. They found that there was a direct relationship between the choice of becoming a surgeon and their perceived lack of anatomy teaching, with the choice of psychiatry and their perceived approval of the anatomy teaching. In the context of Fitzgerald's study, podiatry students who find anatomy more

accessible to learn and have an interest in it, might follow a path of specializing in musculoskeletal podiatry and might feel there is much to learn beyond the undergraduate anatomy curriculum. Whereas those who find it hard and are less engaged are unlikely to pursue this specialty and therefore may feel their anatomy learning is sufficient for their needs. Susie described this as knowing enough to be safe.

Finally, in this constituent of recognising (in)competence in self and others, is students' perceived capability to apply anatomy in clinical practice. Students demonstrate different behaviours, attitudes and abilities to do this, and with perceived success ranging from great to poor. I have compared my findings to those of Lazarus et al. (2012) who suggested that their issues were due to a temporal gap between the acquisition of knowledge and its use in the clinical setting, and a spatial disparity between the contexts in which the students were taught and that in which they needed to use it. Podiatry education differs from medicine in many ways, but the principle differences are in timing and context. Students of podiatry learn the theoretical component of anatomy early in the course and before any clinic has been experienced, but they experience clinical placements soon after and have regular and frequent contact with patients throughout their course. Granted, these may not be patients for whom a musculoskeletal disorder is the complaint, but students still have to apply basic anatomy knowledge to other physical assessments and to the formulation of a diagnosis. Secondly, for Brighton students specifically, the anatomy course is taught in the same building as the clinics, and the anatomy resources are available to the students should they require them. Several researchers have suggested that this contextualisation is the key to successful application of anatomy from the classroom (Smith and Mathias, 2011, Lazarus et al., 2012, Bergman, 2015), but I am unconvinced this is the silver bullet these authors all seek. My suggestions are more towards making the anatomy theory real to students, giving them real cases to work on, engaging them in real stories of clinical practice, and enabling them to solve real problem using anatomy to underpin their practice.

5.28 Reflecting and acting on experience

Reflective practice in nurse education has been a major aspect for a long time (Dearmun, 2000), but reflection in medical education has now also gained in momentum and is now a much larger consideration in curriculum design (Lachman and Pawlina, 2006). Podiatry is aligned to medicine in this respect.

Reflection starts with an awareness that one is reflecting, requiring that learners find space to think deeply about their experiences, examine them inwardly, and bring about a change

in themselves or their practice (Dewey, 1933). Students of podiatry become aware very early in their education of what reflection is and the professional demands for its practice. They may come to the realisation that they have always been reflecting on life, career, family, self and now on learning. However, reflection is not only thinking deeply, or acting on these thoughts, but is a process of analysing a complex situation with the intention to learn (Boud et al., 2013).

Students reflect on their anatomy knowledge and their use of that knowledge in clinical practice. They examine their skills of anatomical assessment of patients, how they gain and refine them and in what circumstances they use them, to provide meaning to their professional status as providers of solutions to clinical anatomical problems. Through expressions of ethical values, clinical behaviours, and a sense of responsibility they scrutinize their anatomy knowledge and understanding to bring about change for the patients. By reviewing their general anatomical podiatric practice, through reflection they can describe what anatomy they employ and how they use it in order to provide effective anatomical patient care. Students also reflect upon their learning; what they learn, what attitudes they have to learning, what strategies they employ for studying and how they manage themselves and their time. Finally, students reflect on themselves as people in the world; what motivates them, what undermines them, what excites and inspires them and what they feel challenged by. Although they have not been analysed in such detail, some of these reflective practices correspond remarkably well with the phenomenon of learning through reflective practice as reported by Rees (2013) regarding final year nursing students. They also translate to the four domains of reflection proposed by Clarke et al. (1996). These were the technical aspects (through the skills of applying anatomy), the practice of the profession (through practice knowledge and its use in solving clinical problems), social, political and economic aspects (through learning anatomy, particularly using cadavers (McNamee et al., 2009), and reflection about oneself (through ethics, values and (in)competence in anatomical practice). This is a holistic view of reflection in podiatric practice, and illustrates how reflection can assist learning and bring meaning to the application of a basic human science.

Dewey (1933) considered that reflection was a process of reflective thought, and needs an emotional, intellectual and practical commitment. He suggested that attitudes commensurate with a reflective thinker are the ability to engage 'whole heartedly', to be intellectually responsible for the new ideas and accept their consequence, and to develop a 'habit of thinking in a reflective way' (Dewey, 1933, p.33). Students of podiatry have the capacity to

practice thinking reflectively in this way and engage with it habitually and purposefully, to enhance their own learning of anatomy and the application of it in practice.

I have suggested that reflective practice is a coping mechanism and students use it to help them manage and learn from situations (section 5.18). This could also be considered the use of reflection as a tool (Habermas, 1971). Habermas was concerned with the nature of the knowledge and the way in which it is used. He considered that if one develops a sense of criticality in reflection, that we examine our own assumptions and the premise on which we hold beliefs, knowledge can push the ideals of empowerment to a heightened understanding of oneself and ones place in the world. In so doing, he believed that people have the capacity to transform (Habermas, 1971, Mezirow, 1990). My study has shown that students can reflect critically. They have the chance to change the whole premise on which their presuppositions have been based, giving them the capacity for transformation (Mezirow, 1990).

There are many ways to foster and support reflection in learning (Hatton and Smith, 1995, Xie and Sharma, 2005, Ireland, 2008, Ovens and Tinning, 2009, Koole et al., 2011, Chan, 2015), and in the effective application of anatomy in clinical practice (Lachman and Pawlina, 2006). This constituent part has permeated throughout the phenomenon, as the findings and discussion have demonstrated, and is considered ubiquitous.

5.3 Critical evaluation of the study

It would be wise to reflect on the rigor of this study in light of some methodological considerations. Early in the study I called into question how many participants are enough for a phenomenological study (section 3.61). Giorgi (1985, 1997, 2009) and Englander (2012) suggest that the researcher should be more interested in the presence of the phenomenon, how many times it appears, and with the depth of descriptions, rather than with the number of participants. They also state that it is a balance between the number of people recruited and the number of times each is interviewed. The aim is to produce enough variation in the data to show the structure of the phenomenon, and not simply the individualised experience of it (Giorgi, 1992). It is interesting to note that both Giorgi (2009) and Englander (2012) recommend the recruitment of at least three participants.

A second methodological consideration is the process of phenomenological reduction of epoché. This is the bracketing out of all theories, all presuppositions, assumptions and beliefs I have known or regarded about the phenomenon of learning and applying anatomy. The question is can this be done? If it cannot then any findings I have presented and discussed

would be open to question. However, elimination of that which is pre-known was not the desired practice. Rather it is a putting aside, to see how the subject presents to the student (Finlay, 2009). Before I began the interviews I reflected on my pre-knowns, assumptions and partialities. This was explicitly stated in section 3.62 and was in order for me to know what I should be laying aside. I approached the data and its analysis methodically and attentively. I paid notice to the phenomenon as it appeared in the data, and withheld theorizing until the analysis was complete and I had discussed my findings (Giorgi, 2009). As people describe experience through their reflection, I cannot claim that my students described the events accurately, but only in the way they experienced them. I was looking for explicit meaning to see the phenomenon for what it is. This is within the realm of phenomenology and ensured my analysis was rigorous. In truth it is a misconception that one can achieve a presupposition-less attitude, instead the phenomenological researcher needs to adopt an open sensibility, free and attentive, not objective and disengaged. It is about managing subjectivity, not eliminating it (Finlay, 2009).

Eidetic reduction is the practice I adopted for reducing the phenomenon extracted from my data to make known the phenomenon of learning and applying anatomy. I studied descriptions from individuals, and through eidetic intuition I was able to reduce their essential meanings to a generalized structure. I had to be open to changing expressions of my phenomenon in order to isolate essential features and disregard incidental ones. I would not claim that I had found the universal structure, but I was able to see past the peculiarity of idiographic description and see what separated this experience from other related experiences, for instance learning and applying pharmacology or becoming a podiatrist. Equally, I employed free imaginative variation to ensure that the structure I had formulated contained only essential, constituent parts. I had to employ some pre-knowledge of the subject area in order to do this; I needed to be able to identify with the structure and believe that it was lived in this way. I did in fact remove an expression, (in)equality and inclusivity of working with others, as it did not stand up to the rigor of being a constituent part. Anatomy can be learnt and application can be achieved without this value, albeit perhaps not holistically. If I had not employed the eidetic, and free imaginative variation, properly I would instead have produced an experiential study. This form of study typically results in themes which characterize the major perceptions of the participants through the data, but not necessarily experienced by all. I have produced a phenomenological study whereby I have revealed the phenomenon through characteristics they all had in common, experienced repeatedly by each student (Finlay, 2014).

In the chapter on data collection (section 3.84) I detailed how, a few days prior to their year one interview and in making an appointment the day following their clinical sessions in year three, I sent the participating students an email with details about the study and the research question to give them time to reflect on their experiences before I asked them for descriptions (Englander, 2012). By conducting my interviews in this way, I aimed to obtain rich description without having to ask too many questions. However, I must ask myself if my students could have over-prepared for the interviews by self-interpreting their experiences and losing the spontaneity to their descriptions? I consider this to be unlikely. At interview the students were natural, relaxed and instinctive and spoke of their experiences freely. However, had they been deliberate in their narrative it would have been of little consequence as the analysis was a description of the educational meaning of the phenomenon, which can include the educational meaning of their self-interpretations (Giorgi, 1997, Englander, 2012).

There are many different phenomenological philosophies and methodologies, which made for confusion and complication in the literature. Once I had identified the central scholars of each philosophy and read their perspectives on phenomenological methodology, I was able to see the bigger picture. I also began to know who the seminal authors were who shaped the methodologies, and thus guide my way of understanding the differences and similarities between them. There are irreconcilable differences among methodologies (Giorgi, 1992). The one central premise of them all was that once I had decided on which form of phenomenology would suit my needs, I should stay with that philosophy and methodology. This did not preclude me from some adaptation for my own purpose, but I believe I have argued for my alterations and kept them in congruence with the logic of my primary phenomenologists, Husserl and Giorgi (section 3.0).

6.0 ORIGINAL CONTRIBUTION TO KNOWLEDGE

This research was carried out by interviewing three students on a podiatry degree programme in the context of higher education. In light of this, and of the critical evaluation (section 5.3), the findings of this research showed that the phenomenon of learning and applying anatomy consisted of eight constituent parts. Through the discussion of these parts, it has become apparent to me that the student experience of learning and applying anatomy is a learning process comprised of three sequential and overlapping stages, mediated by reflection.

Stage one begins with making sense of learning anatomy through an awareness of how they learn and behave, and their cognitive processes of knowledge acquisition. Over an undefined period of time and particular to the individual, this transitions into stage two. This is where meaning is made of that learning by processing knowledge inductively, deductively, or by elaboration, as it takes on a new significance in their lives and their practice. The transition to stage three takes a potentially longer time due to the nature of the course and the aptitude of the student. This stage is working with that meaning in applied settings. Students visualize and manipulate anatomy for the understanding of function and dysfunction of human structure in health, death, pathology and disease. These three stages are underpinned by reflection. Reflection is experienced by the students as personal, professional and critical, and reflection mediates the process of learning and applying anatomy. Figure 6.1 is a reframing of the original diagrammatic representation of the structure of the phenomenon, first presented in section 4.3, to represent a framework of the overlapping stages through which students pass when learning and applying anatomy for podiatric practice.

Weurlander et al. (2016) argued that pathology students journeyed towards understanding from considering the subject as a collection of terms and details, to appreciating it in the clinical context. The three students of my study also experienced anatomy initially as a complex array of terms, structures and functions, but similarly appeared to journey to understanding through very personal and individual means. That insight leads me to further propose that clinical anatomical application affords students a deeper purpose for anatomy, and therefore their learning for, application of, and responsibility with its effective use in practice is heightened.

The study students clearly made meaning of anatomy when they could see its relevance and when they experienced it as a dynamic and fluctuating discipline. This was reported similarly by Miller et al. (2002). But care needs to be taken to prevent students from being confounded by its terms and details, as they may cease to make meaning of their learning and resort to

learning anatomy by rote or disengaging altogether. Susie certainly described this as her year one experience.

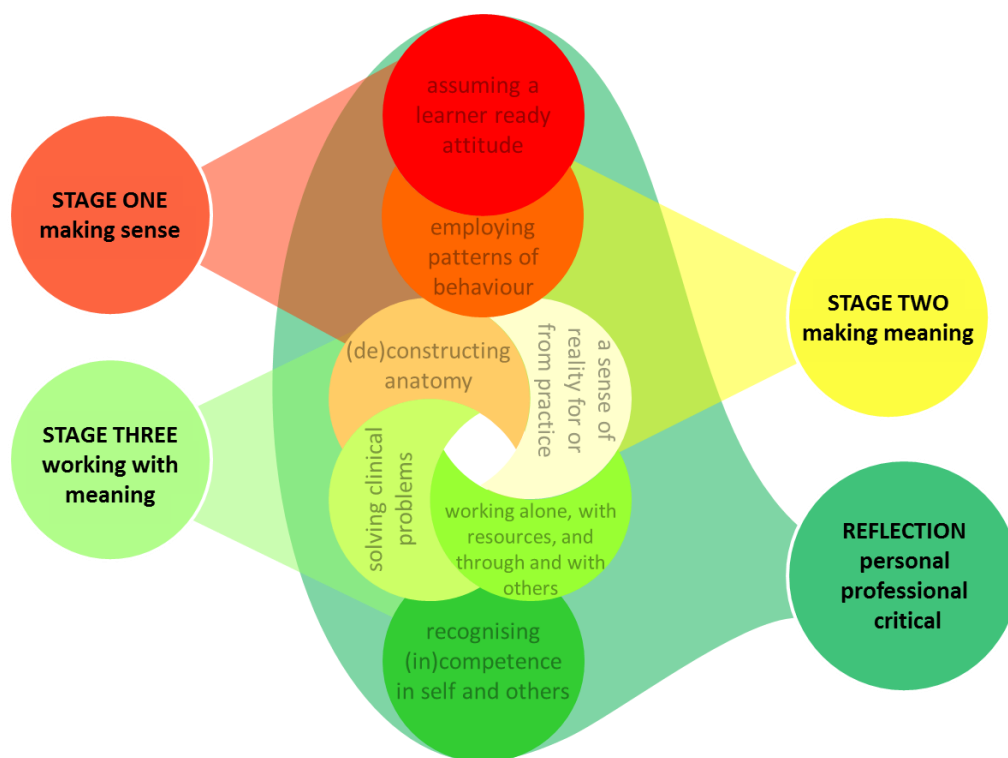


Figure 6.1. A reframed diagrammatic representation of the structure of the phenomenon to demonstrate the three sequential, overlapping stages of the student experience of learning and applying anatomy for podiatric practice, mediated by reflection (Original in Colour)

The experiences described also revealed that students work with the meanings they have made of anatomy, often by exposure to dissection, but mainly as a result of professional patient interaction. They work with the patients, their tutors, each other and with resources to learn anatomy then apply it appropriately in the clinical setting. The findings of this study showed how the study students were developing proficiency, as discussed by Benner (2001), in general and anatomical practice.

The findings also showed that, throughout the three stages of their learning, students develop a capacity for reflective judgement. They become aware of themselves, how they learn and how this affects their actions, emotions and thought processes. The study students made sense, made meaning, and worked with that meaning using reflection habitually, advocated by Dewey (1933), and as a tool, as discussed by Habermas (1971). More latterly, they

developed as practitioners through a personal criticality. This changed their perception of reality and demonstrated both an ontological and epistemological approach to their construction of knowledge.

6.11 Stage one: making sense

To make sense of learning effectively, students engage in two preparatory, ontological endeavors. Initially, students need to be ready for learning both personally and professionally, and possess self-awareness about how they learn. The secondary endeavor is through the process of approach, accomplishment and outcome of organizing learning.

Personal preparation for learning is important for students enabling them to settle into the classroom environment and begin to work with new and unfamiliar colleagues. As was expressed in the interviews, it is an unsettling period when students wish to fit in, and not be distinguished by their past careers and achievements. It would seem to be a gradual transition for students that they come to know the personalities in the room, who they can relate to, and how they wish to represent themselves.

Professional preparation develops when students gain clarity about their objectives of learning. Janice and Richard embraced anatomy as a scientific subject and learnt it for the success it might afford them in their future practice. More generally, this may manifest through a student's sense of responsibility to learn anatomy for the effective care of the patient (section 4.31). They are challenged by the complexity of anatomy and make sense of it by developing strategies for its acquisition. If they are successful, this building of knowledge reassures students that they can communicate with peers, tutors and patients in the scientific language of podiatric practice. This gives them courage and confidence when in practice. If they are not successful, as Susie articulated, they can feel undermined and experience vulnerability and self-doubt. This may lead to learning anatomy by rote, and a lack of enthusiasm for class and cadaver learning opportunities (section 4.33).

Janice, Richard and Susie all tried to make sense of anatomy through being aware of how they learn. By utilizing their own prior systems of learning, implementing new ways of engaging with the subject, and understanding how they translate learning into practice, they have the potential to make sense of the material of learning and their own behaviours towards it.

The secondary endeavour is with regard to students' methods of learning. The analysis of my data indicates that students approach anatomy learning to either cope with the subject,

or affirm their pre-held belief that they are not capable of its mastery. Some students will experience anatomy as the dynamic relationship between the process of acquiring knowledge, and the product of its use in the clinical setting. Other students may display a greater engagement with anatomy when in the clinical situation. These students make sense of the subject once they contextualize the clinical manifestations of dysfunction or pathology and relate it back to the morbid form. This allows them to make more meaningful connections with their previous learning. Had I placed a greater emphasis on making the subject real and relevant from the start of learning anatomy, more meaningful classroom activity may have occurred. In so doing, those students who might identify more with Susie might have been able to make better sense of its use.

Students accomplish their learning and applying of anatomy differently. The findings show that students experience learning anatomy in the classroom, with cadavers, and its application in practice as a complex problem solving exercise (section 4.35). The students develop ways of thinking about anatomy, and its use in clinical settings. These routines and habits help them stay attentive to the discipline and to the patient, although these behaviours also have the potential to be inflexible and counterproductive. Students make sense of anatomy and complex problems when their past and existing knowledge assimilates to form a new understanding, and when they ground it in personal relevance and experience. The gradual outcome of this organized learning is developing a mastery of transfer, and the effective learning and applying of anatomy.

The study students used the content of lectures, hands-on practise and opportunities with the cadaver to gain an understanding of how they learn and behave, and how they acquire knowledge. These cognitive pursuits can mainly be seen through their endeavours to construct and deconstruct anatomy, and recognize how anatomy theory is applicable to the reality of practice. Clearly this blurs the line between stage one of making sense, and stage two of making meaning of learning. Indeed for students to understand anatomy as parts or wholes, a largely stage two enterprise, they need to continue to develop and employ their own patterns of behaviour for use in the classroom, dissection and clinical settings. Both stages are therefore naturally overlapping, as represented on figure 6.1.

6.12 Stage two: making meaning

Through data analysis it was apparent that, when trying to understand anatomy, students want to relate parts with wholes, diagrams with reality, and structure with function. Understanding occurs in the dissection room, in the clinics, or in both. The podiatry students

of this study expressed these experiences as tactile and visual, and that they were meaningful in terms of how morbid anatomy translated into clinical practice, or vice versa (section 4.34). Additionally, these students tried to make sense of anatomy terminology as they might a foreign language, but they generally made meaning of it through its use in clinical communication. This was experienced by all three as being empowering.

The descriptions revealed that when in clinic, students examine the lower limb as a whole and, using conceptual thinking, break it down into its component parts. They picture the anatomy, couple it with their direct knowledge of the cadaver, texts and models, and construct a mental three dimensional picture. In this way, they can make meaning of the sterile, two dimensional textbook figures, and the rather inanimate structures of the cadaver, bringing them to life as a human body in function (section 4.36). This accommodation of knowledge creates new understandings and the students begin to demonstrate the application of that understanding in real clinical situations. As their clinical experiences grew, Janice, Richard and Susie all described their gradual empowerment to progress from novice learners to independent clinicians. Once successful they only required affirmation from their tutors and support to develop even further.

The findings of stage two suggest that students could be facilitated to make meaning of anatomy earlier, creating a greater overlap with the making sense stage of learning anatomy. They need to set aside (temporarily) the acquisition of facts, see anatomy as real and relevant, and be supported in identifying the meaning of anatomy in their own lives. They need to revisit topics to deepen their understanding. What would encourage understanding is the effective use of concepts, and with new found confidence, the detail can be learnt later.

6.13 Stage three: working with meaning

The first two stages of learning and applying anatomy focus primarily on the initial acquisition of knowledge in the class- and dissection room, and the translation of that knowledge into clinical understanding. Stage three, working with meaning appears predominantly in the clinical setting and is a focus on the epistemological application of anatomy for effective practice. Given that clinical practice is experienced from very early in the podiatry course, the overlap with stage two is clearly evident (see figure 6.1).

The study students described how they used their cognition, practical skills and emotional intelligence concurrently to solve complex clinical puzzles, and gain confidence and autonomy (section 4.35). As they became familiar with the practice of podiatry, and with the holistic assessment of the patient, anatomy took on a new significance. It has become

apparent that anatomy becomes an entity alongside other medical, surgical and social practice, and is a contributor to the students' effective diagnosis and management planning. Gradually this increased familiarity with structural and functional anatomy facilitates authentic professional practice bringing the potential for positive health change for the patient.

Those students who successfully grow in confidence in the musculoskeletal clinics, such as Janice and Richard, also gain intuition for clinical anatomy practice. Those for whom clinical anatomy remains a challenge, as for Susie, begin to accept that they prefer the medical areas of podiatric practice (section 4.37). All are conscious of their aptitudes and attitudes, and with both in mind make reasoned clinical decisions. They utilize the ontological meanings they have assimilated and accommodated, and work with inductive or deductive reasoning towards the desired goal of professional competence. My study students found this a largely individual pursuit, with a gradual reduction in their reliance on books, biomechanical theories and other academic resources. As they neared graduation, they viewed the tutor more as a coach than a teacher. Students seem to seek guidance but not instruction, enjoy challenge but not derision, and thrive on being given increasing autonomy. From my data analysis it appears that if these conditions are satisfied by the tutor, then students can work effectively with meaning in the clinical setting (sections 4.31, 4.35, 4.36).

6.14 Reflection: personal, professional, critical

From this research it would appear that reflection underpins the three stages of learning and applying anatomy, and anatomy learning is mediated by reflection. When making sense of anatomy, students are encouraged to reflect personally on their learning. They largely perceive the subject as a science and consider the ways in which they might accumulate its knowledge. This is often influenced by their previous exposure, or lack of it, to anatomy, and they develop strategies and behaviours to help them cope with the enormity of the subject. In their efforts to make sense of the new language and unfamiliar concepts, they begin to question what relevance anatomy holds for them in their lives and in the lives of the people around them. The study also reveals that students examine their own methods of learning and make judgements about their capacity and motivation to learn and apply anatomy.

When students are making meaning of anatomy and its application, they appraise the class, dissection room and early clinical situations, and reflect on what this means for their patient care. This is professional reflection. Those that appreciate dissection consider the ways in

which they can make connections between morbid and functional anatomy, and see it as three dimensional. This students of this study described how they were striving towards professional autonomy and held the values commensurate with those of a qualified practitioner. They spoke of their habitual reflection and self-criticality keeping them grounded, ensuring safe, ethical and competent anatomy practice.

As students work with the meanings they have understood in the previous stage, and move towards qualification, students of podiatry often recognise that reflection is enhancing their ability to learn, and they reflect on their use of anatomy to enable effective care. Janice, Richard and Susie described how they became fully conscious of their competence, and incompetence, and could not help but measure themselves against others. This experience was either empowering and satisfying, or self-defeating. If the latter, it was affecting a students' self-efficacy (sections 4.6, 4.7).

This study has revealed that towards the end of their course, students have brought a measure of criticality to their reflection. Some may examine the premise on which their assumptions, beliefs, and opinions about anatomy have been based and question the attitudes and values to learning and applying the subject they and others hold. For instance, Susie reported being challenged to think critically, and to use reflection in a structured and meaningful way. In so doing, she developed new anatomical knowledge, assessment skills, clinical attitudes and behaviours, and experience significant change in her perception of reality (section 4.37).

6.2 A new model of learning, mediated by reflection

My contribution to knowledge is that I have brought an empirical base to the learning of anatomy for podiatrists. Based on my study of three podiatry students journeying through an undergraduate degree at the University of Brighton, I have proposed that learning and applying anatomy involves making sense, making meaning, and working with meaning, and is mediated by reflection. This is a contextualization of Moon's (1999) universal but theoretical map of learning (see figure 6.2). Moon highlighted three main premises on which learning takes place: the cognitive structure, the assessment of learning, and the role of reflection in learning. The cognitive structure consisted of a five stage process of learning. The map is a complex model based primarily on work by Piaget (1960s and 1970s), Marton and co-authors (1970s and 1980s) (Marton and Säljö, 1976, Marton and Ramsden, 1988, Marton et al., 1997), and literature on reflection (Dewey, 1933, Habermas, 1971, Schön, 1983, Kolb, 1984). The map is in need of support and clarification from empirical work, with only three papers reporting its use as a model by which to discuss data (Jenkins and

Lonsdale, 2007, Moseley et al., 2013, Too, 2013). The three stage process derived from the findings of my study aligns with three of Moon's five stages of learning, and I have therefore used her terminology. I have also found reflection to be an important mediator of learning, and have been able to specify how and when it progresses learning. My work provides a clearer, simplified model based on empirical data and detailed analysis.

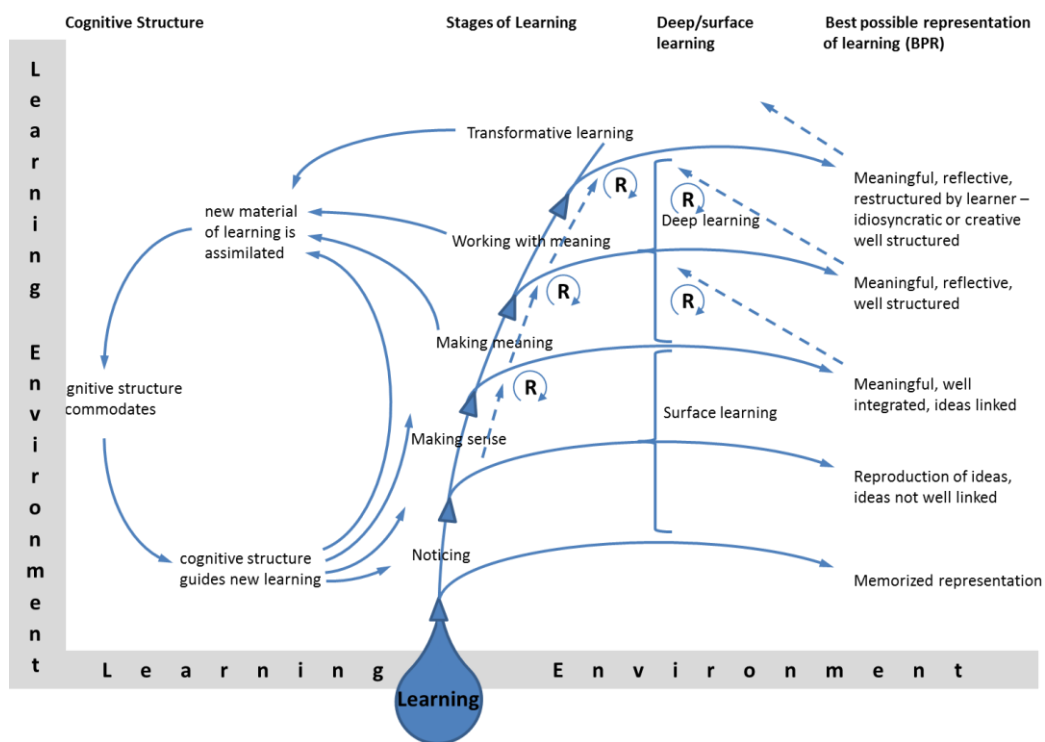


Figure 6.2. Moon's map of learning and reflection (1999)
 Where an 'R' appears, this is when reflection is seen as having a role in learning
 (Original in Colour)

My first stage of learning is making sense of anatomy as a subject, and being ready and organized to learn it. Moon began with a stage termed 'noticing' which was described as a first filter. For Moon, noticing was the selective acquisition of sensory data, learners building an attitude and motivation towards the material to be learnt based on past experience and knowledge. In part, this aligns with my first stage of making sense. I would argue that students of podiatry come to the course already having noticed. From my findings, they are generally learner ready, motivated to learn, and are likely to be aware of their learning preferences. Therefore, they may only require a minor steer to notice these attitudes in themselves, and establish and progress their ideas for anatomy through the stage of making sense. I would therefore consider that noticing plays a less significant part in learning and

applying anatomy. What students will not have noticed before are the learning outcomes, assessment for the module, and the opportunity to dissect a cadaver.

In my study making sense also encompasses the organization of students' learning. Students of podiatry hold themselves responsible for patient care, even when they know there is a tutor who is accountable, and this motivates them to organize their learning and perform anatomical examinations appropriately in the clinic (section 4.31). This is supported by Bergman et al. (2013a, 2013b) and Jenson and Lahn (2005), who also agreed that students can feel undermined if they are discovered to be inept. For Moon, making meaning was a time for establishing the coherence of subject material. It may involve prior knowledge, or simply the acquisition of new information, but her map depicts the learning as being rather superficial, rote learning or a reproduction of ideas. The findings of this study suggest that this is a simplistic view of this stage in the process. My study demonstrates students' desire to grasp its language for effective communication, ground anatomy in relevance and reality, and master transfer from class and cadaver to the applied setting. The early clinical encounters students of podiatry experience permit the application of knowledge much sooner than Moon may have considered likely. Podiatry students have many opportunities to use their new knowledge and discuss how their understandings are meaningful in a clinical context.

For Moon, making meaning of the subject was where the new material of learning interacted with the existing, and a new understanding was formulated. She expressed it as a deepening of learning and a building of understanding in the discipline. For me, making meaning is achieved when students are able to translate the two dimensional content of anatomy into the human form they encounter in the clinic, or vice versa. They are accommodating the knowledge but are also applying it in relatively non-complex situations and making meaning of their anatomical assessments in practice. These early experiences develop their understanding. By experimenting with concepts, and forming skills of professional practice, students begin to make meaning of human structure and function, and understand it in the context of patient assessment and diagnosis. By this stage, students of podiatric anatomy will be linking concepts and ideas, and be taking a more holistic view of the anatomy based care of patients.

In my findings, I spoke of system one and system two learning, as proposed by Kahneman (2003). By year three, students of podiatry have largely mastered system one learning when they are working effectively with the meaning of anatomy. They have assimilated all their resource material, processed, accommodated and modified its meaning, and are now

working on refining and developing further understanding. They may return to the resources for consolidation or to learn more, but are relatively proficient clinicians and nearing qualification and graduation. When working with meaning, students find the use of anatomy in practice a meaningful endeavour, enabling positive and effective outcomes for patients. This aligns with Moon's definition of working with meaning.

What also aligns with Moon is the idea that tutors are more a coach than a teacher. Activities that promote working with meaning such as guiding students' ideas, encouraging enquiry, and providing feedback are more beneficial at this stage. Students are tackling complex clinical problems and using inductive and deductive reasoning to do so. Their employed patterns of behaviour are enabling them to process these new, complex and unfamiliar problems by allowing their intuition to take control. They can then apply cognition, skills and attitudes to bring about more effective practice.

The results of the study have identified that reflection occurs throughout each stage of the students' learning and applying anatomy. Initially, students described their reflections in terms of thinking deeply and of thinking habitually. These are ways of examining learning at a relatively personal level, considering their early thoughts and experiences and their affect. Moon considered reflection to have a role in the upgrading of learning, or a movement from a lower to higher order thinking. For podiatry students, this upgrade appears to occur when moving from making sense to making meaning of anatomy and its application. When making sense, students assimilate a good proportion of knowledge. At the stage of making meaning, they are accommodating that knowledge to bring about new understandings. The role of reflection here could be equated with professional reflection-on-action (Schön, 1983), students reflecting after the event on how their knowledge of previous similar events may have led to the present experience, and what the student needs to change for the future, creating a new meaning.

Moving from making sense to making meaning appears to be grounded in a surface approach to learning, as proposed by Marton & Säljö (1976). Anatomy learning is isolated, around knowledge acquisition, and is not connected to much prior information. When moving from making meaning to working with meaning, students are deepening their understanding and use reflection as a tool to facilitate progression. They use reflection to strengthen the connection between theory and practice, support their clinical decision making, and provide meaning to their professional practice. This is considered to be taking a deep approach to learning (Marton and Säljö, 1976).

Students who are nearing the completion of their course, and therefore their anatomy education, are encouraged to work beyond working with meaning. They are stretched and challenged to consider a more critical view of their learning and of themselves. As their undergraduate experience progresses they grow intellectually and develop self-discovery, anatomical proficiency and critical self-appraisal. They change as people when their attitudes and values are tested, and develop as professionals as their practice is enhanced and they become autonomous. Experiences such as these can be life-affirming, hugely satisfying and emancipatory (Habermas, 1971, Mezirow, 1990). Included in Moon's model was the stage of transformation, drawn from the theory of transformative learning by Mezirow (1990). His theory was around the concept of adult learning that allows people to recognise and reassess the assumptions, including misconceptions, which frame their thinking, feeling and acting. He reasoned that *transformation* suggests a *form* to be changed, possibly an epistemological change fundamental to a person's expectations and beliefs. My study did not reveal such a significant change in the students, although one student was moving in this direction and questioning the whole premise on which she had built her clinical life. However transformation can also simply be behavioural or content driven, and move the student's thinking on. If this is the case then transformation would seem to play a significant part when moving the student between stages one, two and three of learning and applying anatomy.

7.0 CONCLUSIONS

The focus of this thesis has been the lived experience of podiatry students when learning and applying anatomy. Little has been written about podiatry students and their learning, and particularly little about their learning of anatomy. Literature relating to medicine, nursing and other allied health professions has offered some interesting insights into the impact of anatomy learning, which may be applied to students of podiatry.

The study was conducted using a scientific descriptive phenomenological method. The aim was to gain insights into the phenomenon of learning and applying anatomy, and to describe the phenomenon using a structure that captured the constituent parts.

The research question was: what are the lived experiences of podiatry students learning and applying anatomy? The sub-questions were therefore:

1. How do three undergraduate students describe the experience of learning and applying anatomy across the podiatry curriculum?
2. What are students' lived experiences of learning and applying anatomy for podiatric practice?

Three undergraduate podiatry students were interviewed up to four times each, once in year one and up to three times in year three. These interviews took place after periods of anatomy learning, or following the application of anatomy in practice, and provided rich descriptions of these students' experiences of learning and applying anatomy. The interview transcripts were analysed using the Giorgi method of descriptive phenomenological analysis to reveal the meanings students make of learning anatomy, and applying and developing that learning in practice.

The lived experiences of students' learning and applying anatomy for podiatric practice revealed the structure of the phenomenon. It was found to consist of eight inextricably linked constituent parts: 1) assuming a learner-ready attitude, 2) employing patterns of behaviour, 3) (de)constructing anatomy, 4) a sense of reality for or from practice, 5) solving clinical problems, 6) working alone, with resources, and through and with others, 7) recognising (in)competence in self and others, and 8) reflecting and acting on experience.

Each constituent part was presented to demonstrate how the students expressed their lived experience of learning and applying anatomy, and how the eight constituent parts of the phenomenon were interdependent. The findings were then discussed, firstly in terms of how they were lived and described, and secondly in light of the appropriate literature.

The findings of this study showed that students' experiences of learning and applying anatomy is a learning process comprised of three sequential, overlapping stages which are mediated by reflection. Stage one was the making sense of knowledge through self-awareness of how they learn and behave, and the cognitive process of knowledge acquisition. Stage two was making meaning of that learning by processing knowledge inductively, deductively, or by elaboration, as it takes on a new significance in their lives and their practice. Stage three was working with that meaning in applied settings, visualizing and manipulating anatomy for the understanding of function and dysfunction of human structure in health, death, pathology and disease. These three stages are underpinned by reflection. Reflection is experienced by the students as personal, professional and critical, and reflection mediates the process of learning and applying anatomy.

These findings can offer new direction to teachers of anatomy for podiatry to facilitate learning, and may be transferrable to other healthcare professions in which anatomy is a component. In chapter eight, recommendations for teaching are made which address each sequential stage of learning, and the underpinning reflection.

8.0 RECOMMENDATIONS FOR PRACTICE

This research suggests that the learning and understanding of relevant and applied concepts of anatomy should be more important than knowing and remembering anatomical detail, early in the students' programme. As clinical practice is experienced and anatomy is put into practice, the results suggest that confidence with the concepts will grow, understandings of anatomical details will develop, and the skills leading to correct diagnosis and effective management will become established.

In light of this new knowledge, several recommendations are made for anatomy teaching and learning practices in both theory and clinical settings. The recommendations are intended to help enable students to make sense, make meaning, work with meaning, and foster reflection, through their education for professional clinical practice.

8.01 Making sense

Recommendation 1: Anatomy for understanding and communication

Challenge students to think differently. Concepts should be learnt first, detail can follow later. Students find the language of anatomy and the complexity of the anatomical details taxing. They use a disproportionate amount of time storing detail in their memories to the expense of knowing why they need it, how the detail relates to function, and how to communicate anatomy in the clinical setting. Teachers should concentrate on helping students understand and communicate concepts such as how the anatomy of the lower limb is organized, how muscles work against gravity, and to identify structures through touching the skin surface (surface anatomy).

Recommendation 2: Seeing relevance and applying it to real situations

Anatomy is real and relevant and should be viewed as a dynamic, anomalous, fluctuating discipline. Helping students to understand their own anatomy and that of other people in their lives can give them a sense of purpose and a relatable experience. Students need to use themselves as models, practise on each other, draw on personal, family and friends' experiences and utilize their own powers of observation of people walking or running. When they bring what they see in everyday life to the classroom they will understand that people can have a normal anatomy but perform locomotor activities in different ways. This will encourage discussion about what it says about individual anatomical structure and function.

8.02 Making meaning

Recommendation 3: Solving clinical problems

Students should be provided with the tools to solve clinical problems. Real case studies present students with anatomy conundrums and they can use their powers of reasoning and enquiry-based analysis to conceptualize the whole picture, work out what they need to know, have this direct their research using appropriate resources, and enable them to formulate an anatomy outcome. Sharing this with others creates opportunity to explain concepts and demonstrate understanding, and fosters independence in learning.

Recommendation 4: Grasping three dimensional anatomy

Students need help converting images from books and photographs into three dimensional anatomy. Medical imaging such as diagnostic ultrasound can be used in the classroom. Teachers can demonstrate on students, students can operate the equipment under supervision, and the images can be projected onto a screen. Models of anatomical parts can be made using clay or plasticine, to recreate anatomy and visualize structural relationships. These are interactive methods that engage students in making meaning of anatomy.

Students need clear guidance on their expected achievement in the dissection room. Task setting can guide students to see structures as relational, distinguish structures from each other, and experience the size, shape and position of structures. Students can find relevance through understanding how the morbid anatomy of the cadaver relates to the assessment of a patient.

Teachers need to help students apply their classroom and dissection learning to the clinical situation. Anatomy knowledge is used in all phases of a patient consultation, but particularly during physical examination. Students must examine the anatomical structure, and develop particular assessment skills to understand the function and dysfunction of that structure.

Recommendation 5: a spiral curriculum

Consider developing a spiral curriculum to build learning events and deepen understanding. Topics should be taught on multiple occasions throughout a course, each time developing the topics for extended understanding. For anatomy, keep the first loop of the spiral basic, with only a little detail. Each time contact occurs, develop the concepts so students draw on their past learning, reinforcing and advancing it to become new understandings. Students should gain knowledge, confidence and the ability to apply anatomy to practice.

Provide learning opportunities with cadavers throughout the course. Early cadaver work can be a technical exercise and students concentrate on the individual anatomical components.

As their course progresses, new aims and outcomes of learning can be set to facilitate students to gain a deeper understanding of anatomy through the dissection experience.

8.03 Working with meaning

Recommendation 6: developing clinical tutors

Build the teaching capacity of the clinical tutors. Clinical tutors must facilitate students to apply anatomy knowledge and understanding effectively in practice. Clinical tutors need the capability to empower students to draw on their knowledge, discuss their understanding and use anatomy as a clinical subject. Students should be facilitated to strengthen the correlation between the acquisition of knowledge and the learning of clinical skills. The practise of skills in the appropriate clinical situation will build confidence in anatomy competence, improve efficacy of anatomy application, lead to more autonomy in practice, which in turn should lead to better patient outcomes.

Clinical tutors should have the ability to help students reflect. Students need guidance to reflect on their knowledge, understanding and use of anatomy in practice. They also need to reflect on their professional development and on themselves as learners and as professionals.

Tutors and students should be prepared to know and be known professionally, and have mutual respect for each other's intellect, ability and attributes. Students can then concentrate on their learning and on the needs of patients, work with meaning, and synthesize their knowledge. With a supportive tutor-student relationship there will be positive benefits to students' self-efficacy of confidence, motivation, esteem, respect and acceptance.

8.04 Fostering reflection in learning and applying anatomy

Recommendation 7: personal reflection

Encourage students to identify their individual learning preference, and develop their pattern of behaviour, early in the course. Equip them with the tools to access learning, produce teaching material in a variety of formats to address an array of learning preferences, and strengthen their ability to access materials in their non-preferred style of learning.

Direct students to learn anatomy as applied to practice, present it in the classroom, and engage in facilitated feedback. They can be encouraged to develop and broaden their understanding of themselves as learners, their ability to communicate both simple and complex problems, and to foster a shared attitude to the endeavour of learning.

Recommendation 8: reflection through learning with cadavers

Encourage reflection through working with cadavers. Prior to the experience provide students with opportunity to discuss and reflect on donation, the dissection process, and the reasons for learning through dissection. Fears and concerns can be allayed before they become heightened or intentionally avoided. A debrief session after the experience provides space for students to explore their emotions and discuss respect and professionalism. Reflection can be on meaningful life experiences, coping with trauma and death, or the consideration of what meaning our lives and bodies hold for us as people and as healthcare professionals.

Use the cadaver as the source of a clinical problem. Should the cadaver display an anatomical anomaly or a pathology, let the student work through the challenge and produce an article of learning, such as a report or poster. Let them share this with colleagues in the classroom, and reflect on their powers of observation, of evaluation and analysis, of anatomy knowledge and understanding and of transferrable skills such as communication, critical thinking and research.

Recommendation 9: reflection on learning and understanding in practice

Provide opportunities for students to reflect on whether they have understood anatomical concepts and function, applied them appropriately, and developed a deeper understanding of anatomy as applied to practice.

Invite students to reflect on their clinical problem solving skills. Assist them to reflect not only on the outcome of their professional care but also on the attitude they had to it, their knowledge base and where the gaps in their understandings are, the methods they used to solve the patient's presenting problem, and the errors that they may have made along the way.

8.1 Suggestions for further study

This study has focused on the lived experience of learning and applying anatomy for podiatric practice. While I anticipate there may be similarities in the phenomenon, it would be interesting to repeat this study for other healthcare professional groups.

Fitzgerald et al. (2008) investigated the career intentions of newly graduated doctors and correlated them with how satisfied they were with the anatomy teaching they had received at medical school. Having presented findings that suggest that complex knowledge of musculoskeletal anatomy is generally only required if specializing in this area of podiatry

practice, a repeat of the Fitzgerald study (2008) investigating the use of anatomy in professional podiatric practice according to the scope of practice of the practitioner, may provide useful information.

Various studies focused on medical students' learning using cadavers have been published. Examples are the motivation to learn anatomy through dissection (Smith et al., 2014, Abdel Meguid and Khalil, 2017), engaging students through learning with cadavers (Pawlina and Drake, 2016) and how dissection enables learners to adopt professional attitudes (Lachman and Pawlina, 2006). To repeat these studies, and investigate the lived experience of learning through cadavers for podiatrists, would again be useful and add to the knowledge gained by Smith et al. (2017) and Weir and Carline (1997).

I have argued, supported by the work of others (Miller et al., 2002, Norman, 2009, Bergman, 2014, Machado, 2017), for the teaching of anatomy concepts before the learning of detail and language, but I have yet to find evidence of its efficacy. Robust research using a variety of paradigms needs to be undertaken to test, gather student attitudes towards, and measure the impact of this teaching strategy. This would establish whether or not it does indeed help students learn and apply anatomy effectively in practice.

My findings about the role reflection can play in learning and applying anatomy align with those of Rees (2013). It would be interesting to do a further descriptive phenomenological study specifically to understand the lived experiences of podiatry students of learning through reflective processes. This would take the broader view of clinical practice, rather than having an anatomy focus, and may help teachers of clinical podiatry understand more closely how students can be supported in being and becoming qualified reflective podiatric practitioners.

Finally, more studies into the application of anatomy, and other subjects, in clinical practice would help all teachers of healthcare to learn and understand more about the impact of their teaching, the effect of student learning on clinical practice, and the effects on patient outcomes.

9.0 REFLEXIVE AND REFLECTIVE OBSERVATIONS

From 1988 I was a qualified nurse working in orthopaedic theatres and general wards. I qualified as a podiatrist at the University of Brighton in 1995 and was taught a very traditional anatomy curriculum. I have been the teacher of anatomy in the podiatry department for nearly 25 years and I am passionate about students' learning of it. My drive to study this subject started when I orchestrated a critical review of the BSc (Hons) Podiatry course at the University of Brighton in 2010-12. As part of this review, the team and I met for a series of sessions to reflect on and explore the current programme. We were looking for its strengths, areas that could be culled, and areas that needed to remain but which we considered were currently not effective learning experiences. The day came to discuss the essential but troublesome subjects and I declared that I felt anatomy was one such problem area. The team and I considered that it was taught well in year one, and that our approach of using cadavers as a learning strategy was highly appropriate. However, we identified that the students, while they could learn regional anatomy reasonably effectively, were struggling to apply it in the clinical context. It would take most of them the remaining two years to be able to use their anatomy knowledge to formulate diagnoses and management plans for the effective care of the podiatric patient. As a consequence, we rearranged the two smaller anatomy modules into one larger one, and incorporated the terminology, principles and application of biomechanics. This was in an attempt to integrate the structure, and the function, of the musculoskeletal system for a better understanding of human movement. But the student learning did not noticeably improve.

My areas of research to that point had been in reflective practice and its promotion in a healthcare curriculum (Dewey, 1933, Habermas, 1971, Schön, 1983, Kolb, 1984, Van Manen, 1991, Johns, 1994, Van Manen, 1995, Moon, 1999, Young, 2004); and in autonomous learning, the development of the learner who is independent and can take responsibility for their own learning (Boud, 1988, Broad, 2006, Marshall, 2008). I had been engaged with understanding learning preferences (Newble and Entwistle, 1986, Fleming and Mills, 1992) and have always considered that the student should be conversant with their preference for learning so they can tailor their efforts in the learning process productively.

In February 2013 I attended a Learning and Teaching Conference run by the Centre for Learning and Teaching in the University. I heard an anatomy teacher at the medical school speak about learning preferences and their implications on anatomy learning and my interest was piqued. Not only was this a subject bringing two of my interests together, but more importantly this was the first time I had heard anyone speak about research in the subject of

anatomy learning. I was beginning to realise I was not alone in my endeavour to enhance anatomy learning, and that is when my journey began.

9.1 Reflections of the doctoral journey

I enrolled on the Doctorate in Education that summer and wrote a literature review on how students' learning of anatomy can be enriched. I discovered that this can be encouraged through effective assessment, assessment for learning, not of learning (Boud et al., 2013). This spurred me into changing the assessment for my module from a written examination to a patchwork text (Scoggins and Winter, 1999) and set me on the journey I am on now.

I collaborated with the medical school anatomy teacher I had heard speak, in research into the similarities and differences medical and podiatry students have regarding learning anatomy (Smith et al., 2017). During this work I discovered that there was considerable disquiet amongst the podiatry participants regarding learning through cadaver dissection. This shocked and surprised me. My holy grail of learning anatomy was getting heavy criticism and I was compelled to know why. I wanted to understand their experience of doing dissection and therefore their experience of learning through this method. I knew what dissection was like for me, I have dissected well over 30 bodies, but what was it like for them? This led me to phenomenology as a philosophy.

My next piece of work was to investigate the experience of podiatry students' learning of anatomy through the module I ran, and how they make meaning of it. Through interpretive phenomenological analysis I found that their past experience of learning anatomy played a small but not unimportant part, and that they found anatomy highly complex and struggled to find the meaning in real life. Significantly, three of the four participants reported finding dissection meaningful; that they got a sense of clarity of meaning by studying the three dimensional structure, and that there was value in that learning. I concluded that the deep approach they were taking to learning anatomy (Marton and Säljö, 1976) was triggering and motivating them toward understanding.

Now I had grasped something of the experience of learning anatomy through my teaching strategies, including performing dissection as a method to learn, I wanted to turn my attention to how students apply that learning in clinical practice. How do they convert regional anatomy knowledge into useful functional anatomy understanding? By researching students' perceptions of how they think they learn, and by observing them in clinical practice, I wanted to discover the ways in which students make sense of anatomy learning, and apply their understanding to its practice in clinic.

To do this, I chose to research my own students. I have wondered if this is out of conceit, or arrogance. Do I hope to justify and validate my own teaching practices? Am I looking to demonstrate my worth as a teacher? I believe my motives are more philanthropic. I am reflective by nature and wish to do better by my students. “Unless teachers develop the practice of critical reflection, they stay trapped in unexamined judgments, interpretations, assumptions, and expectations” (Larrivee, 2000, p.293). The experience of this research has been a humbling one. I believe my participants have been honest, truthful, sometimes brutal, but always genuine. I am now moving to a better understanding of what meaning students make out of classroom activities, and how they make sense of it in their clinical practice. What better way to reflect on my own teaching, and have confidence in my amended practice?

9.2 Reflections about the teaching of anatomy

This study has taught me to keep anatomy based in students’ reality. Even though I have said to students not to get fixated on terminology and detail, I recognize that this may not have been borne out by my teaching and assessment practices. I have been overly attentive to the language of anatomy, muscle names and the art of dissection, and less observant of concepts, converting two dimensions into three, and the wider goal of understanding anatomy in practice.

My first reflections on my practice are about authentic learning. Since the collection of my data for this study I have introduced paper case studies into my teaching as a method to bring a sense of reality to the students. I have used them to illustrate anatomy and how it can be applied to professional practice. I have also engaged with using YouTube videos as a means to demonstrate the concepts of anatomy in action visually. For example normal and pathological gait patterns, when a foot ‘rolls over’ (over-pronates) during walking, and how footwear can affect stability. I have also started using Camtasia to produce simple lectures, posting them on the virtual learning environment prior to the session, and asking students to bring their questions with them. Anecdotally, the students have been more engaged, maybe even had more fun than in my previous anatomy sessions and I feel that I have been helping them on a journey of learning to a greater extent.

I have started discussing dissection differently. I have become acutely sensitive to the attitudes and emotions of my students and encourage open dialogue about the generosity of donors, about death, rigor mortis and the embalming process, and I ensure we have space to conduct a de-brief post-dissection. I am also far more flexible about the learning of anatomy

through other methods should a student not wish to learn through dissection or prosection. I have many more ideas now to engage students in this environment when they are not actively dissecting, and to have learning goals for sessions to make the learning active and relevant.

One other enhancement of my teaching of dissection has been of its distribution throughout the course. Since embarking on the doctoral journey I have understood the significance of revisiting the cadaver in later years, and have expanded the dissection experience into years' two and three. In year two it is used as a resource to understand functional anatomy, and in year three it is an optional re-visit to explore the upper and lower cadavers with the aim of expanding understanding of pathologies and reinforcing knowledge of anatomy.

I have changed the module assessment from a written examination to a patchwork text, an assessment for learning. The patchwork text was first introduced by Scoggins and Winter (1999) to engender critical thinking and critical self-reflection and its use has been researched by Winter (2003), Akister (2003), Maisch (2003), Ovens (2003), Smith (2003), Crow et al. (2005) and several others. When applied to my classroom, the students are asked to undertake small tasks or short pieces of writing about an aspect of anatomy, periodically over the duration of the semester. After each task, they bring the product with them to the classroom and discuss their 'patch' in small groups. I provide a series of reflective questions at the start of the session and their peers are requested to use them to offer a sensitive critique and suggestions for improvement. The students are permitted to rework their patches before they are all submitted as a summative collection at the conclusion of the semester. To accompany their work they must provide a reflective narrative, the 'stitching', explaining where their learning has taken place and how that has influenced their understanding of anatomy. This assessment has been in place for three years now and module evaluation has shown it to be accepted as a method, favoured over other forms of assessment, and welcomed as a means to learn anatomy.

By utilizing the patchwork text assessment method I am attempting to motivate my students by directing their anatomy learning towards relevance and reality of practice. I have designed the assessment so it discourages students from memorising names and terms, promotes anatomy learning in terms of concept and function, and allows them to see why a practitioner might need to learn that information or activity. I consider that this continuous form of assessment paces students' learning, engages them with the material on a regular basis, and encourages a deeper appreciation of anatomy for practice. By supporting reflection on learning anatomy as a subject, I may be inspiring my students to critical reflective practice

with the potential to enhance clinical anatomy understanding and enable them to become effective and reflective podiatric practitioners.

Several areas of research interest have emerged for me from my use of the patchwork text. The first is to assess how the patchwork text affects the anatomy knowledge of my students, the second is to assess its impact on the application of anatomy in clinical practice, and the third is to investigate if the patchwork text assessment strategy affects learning in other areas of the undergraduate curriculum.

9.3 Reflections about phenomenology as a methodology

I have found phenomenology a challenge. How does a person understand what it is like to live their life? We all live in individual worlds of context, culture, relationships, knowledge and emotions. How can another hope to enter that lifeworld and claim to understand it? My solace is that the structure of the phenomenon is representative of a general lived experience of the phenomenon; a structure that is to apply to the many, not to the few, and it is my experience of anatomy, of teaching, and of learning for myself that helps me unravel the efforts and experiences of my contributors.

My major dilemma was about which phenomenological methodology to use. I struggled initially through my poor understanding of the various methodologists of phenomenology and the differences in the descriptions in the literature (Moran, 2002, Englander, 2012). The terminology was different and new to me (epoché, eidetic) and there was such debate over descriptive and hermeneutic methods, so I trialled two forms. My first small study was descriptive. I enjoyed it and although may not have followed the descriptive phenomenological method precisely, I felt it was a start. Reading the assignment now, I realize how off the mark I was and it demonstrates to me how far I have come on this doctoral journey. For my second small study, I used interpretive phenomenological analysis. Unwisely, I chose it as an approach not a methodology and combined it with the case study research design. The result was a cursory nod to phenomenology and a poor analysis of my students' interviews. However, I had gained a great deal from these studies and was ready to embark on the full thesis. But I was still in a quandary about which kind of phenomenology to use.

My moment of clarity came suddenly. I realised several things; that all phenomenology was descriptive until the researcher chose to interpret, that I had conducted interviews in the descriptive paradigm, that I identified strongly with the core principles of descriptive phenomenology, and that there was a lot of literature that I had not yet accessed and that this

would show me the way. I then read study after study of the descriptive methodology and gradually become aware of my purpose; not to change the world, but to bring into focus that which had not been seen before, from an educational perspective. My guides were then Husserl (2002) and Giorgi (1985), with good examples of researching in this way by Mastain (2006) and Vuoskoski (2014). The way became a single path, and I had clarity of focus and thinking.

I have realised that I learn in a similar way to the students of my study, in that I deconstruct and then rebuild. I found it hard to see the whole, so I deconstructed phenomenology, part by part, until I could see it in totality. Then as I was doing my write up, I deconstructed it again to see the parts and address each stage of the process. I have tried to be reflexive, I have always been conscious about how my presence has influenced the research and I am sure it has. But I do not believe it is the poorer for that, indeed I trust it is the richer.

9.4 Reflexivity in my research

I need to consider how I, or other subjective elements, may have impinged on or transformed my research. I have been reflexive and engaged in critical self-aware analysis (Finlay, 2002) to examine the (un)conscious processes that may have influenced the relationships between me as the researcher, and my students as the researched.

I have examined my relationship with the students themselves. Over the course of the study I have come to know these three people well. I have taught them in the classroom, dissection room, clinic, and have supervised them in practice. I have also held a more powerful relationship through my role as course leader, module leader and assessment examiner. I have considered how this might have influenced the students and acknowledge that this could have occurred in a number of ways. They may have felt inhibited in what they said or described for fear of some sort of reprisal. I would counter this firstly by explaining that their module result was known and ratified at examination board before they volunteered to be interviewed in year one, and secondly I refrained from examining or marking any of their work in year three. The students were well aware of these facts prior to interview. I have also wondered if they may have been reticent to say a few things because of worry about offending me. This point has taxed me and it is possible they have. However, the students always seemed comfortable to share and wanted me to know their experiences. Phenomenologically, what they may or may not have withheld would not have inhibited my analysis of the data using a formal method and thereby seeing the phenomenon for what it was. As I have mentioned (section 5.3) should they have manipulated their narrative in any

way, it would have been of little consequence. The process of analysis mitigates against undue impact on the phenomenon from outside influence.

Having been a nurse prior to studying podiatry, I had an affinity with Susie and her struggle to understand anatomy. I never revealed this to her. She may have known about our mutual first profession, but she was unaware that I also questioned the premise on which I held my beliefs, attitudes and values in healthcare. I came to podiatry as a caring and experienced nurse with an exceptional work ethic, eager to continue my healthcare education and develop myself. What confronted me was challenge. My anatomy and physiology knowledge and understanding was poor, my appreciation of systemic disease was lacking, and my diagnostic skills were in their infancy. Being conscious now of my incompetence, I questioned how I had ever been effective in my nursing career. I took comfort in the podiatry clinic where I felt confident with communication, pharmacology, practical skills of wound dressings, manipulation techniques, and basic patient interactions. Like Susie, I felt pressure to achieve and was undermined when learning did not come easily. I mention this for completeness of reflexivity, and can only trust that it helped me re-express her meaning units with compassion and honesty whilst maintaining the phenomenological attitude.

Of possibly more consequence is the demographic of the students. These three students came forward voluntarily. I do not know their motives, but I do know they did not collaborate with each other prior to consent. However, they have several similarities. They are all Caucasian, of a similar age, had all been educated to at least degree level prior to the start of their podiatry course and had all worked as professionals in various environments before. Was it possible, therefore, that there was not enough variation in the students being researched? I now reject this notion. I invite the reader to consider the biographies in appendix 1. These illustrate the diversity of the three students in upbringing, early education, relationships with parents and significant others, and substantial events that had an impact on shaping their lives. So while the three students share similarities on the surface, underneath they are incredibly different. The depth of the interviews and data analysis showed wide variability between them in the way they approached and engaged with learning, even though they had all been educated to a higher level in the past.

In addition, I have known these people as students on the podiatric clinics, working with them frequently in the in-house university clinics and supervising their anatomy in practice. My argument is that it is the very nature of this context, clinic being a professional area and supervision an intimate activity, which offers the best opportunity to get the student perspective. To support this, and to counter that three students with such similarities may

have somehow misrepresented the lived experience, this thesis has been developed under the supervision of two eminently qualified researchers. Each has brought to the study their own views of researcher and researched, their individual understandings of the subject of anatomy, and their own lens to qualitative research and the methodology of phenomenology.

I have wondered if my method of data collection has impinged on my study in any way. Firstly, I carried out observation of the clinical sessions and secondly, I video recorded the students in clinic. I found the observations useful, but I did not use them in my analysis. Observational data is treated somewhat differently to narrative, and for different qualitative purposes. In phenomenology, close observation can be used but usually only in circumstances where the researched are unable to be interviewed or supply written narrative of their experiences (Van Manen, 2016, p.68). Studies of young children fall into this category. Video recordings are seldom used as data in phenomenology. Video analysis is particularly useful for the collection and use of non-verbal communication, for instance pauses, eye and arm movements, and posture. These would have added little to the essential meanings of the student descriptions and I did not use them. Indeed they do not align with phenomenal thinking or form credibility in phenomenological research (Van Manen, 2016, Green, 1995). I do regret using video and would not use it again. Susie was particularly sensitive to those around her, and I would suggest she found being video recorded a distraction and probably an embarrassment. On occasion, I did ask the students if they considered my presence or the video camera to be distracting or to somehow contribute to an alteration of the experience. For the most part, they said not but in all honesty, I cannot be sure. I was interested in the phenomenon as it appeared to my students, and with the depth of that analysis. By watching a few patient interactions and possibly creating in the students a more attentive attitude to what they were doing and thinking would not have altered the phenomenon as it was lived across the three years of the course.

Having written this thesis, I have now looked back and questioned if I have been true to the methodology. Had I bracketed out my pre-knowings, and had I truly taken on the educational phenomenological attitude? Have I demonstrated consistency? And have I applied Giorgi's scientific descriptive phenomenological method robustly throughout? I have had many conversations with my supervisors about the nature of the study, the way in which it needed to be conducted, and how it was been written up and have had to defend it at many turns. But in defending it I have had to understand each stage, apply the methods rigorously and justify my findings. My supervisors have kept me in check and made me voice my methodological vulnerabilities. In defending it, I have been enabled to reflect on my work,

on my practice, and on myself and I believe I have been true to Husserl and Giorgi as far as they were able to take me. The rest was up to me.

9.5 Final thoughts

For me, learning through this doctorate has been a joy and a struggle, giving me a sense of happiness and a sense of enlightenment. At no time has it been a chore. I have learned again what it is to be a student, the highs and lows and the emotion of assessment and feedback. I have had tensions with time and brain space for research competing with my general work commitments. But I have experienced the development of myself as a person, a researcher, and most importantly for me, the development of myself as a teacher. I have come to understand the nuance and subtlety, the inferred and influenced, and the changed perceptions of my life world; my own reality and of my experience.

I am humbled by my student participants. They gave so much of their time for me, and I know how precious that time can be, without a hint of fuss or bother, without hurry or distraction, without pressure or oppression, with sincerity and giving, and with a calm friendship and professionalism.

I have so much to thank them for. I was a student, they were a student. I was a teacher, they were teaching me. I was a research instrument, they were being researched. They were learning anatomy, I was learning how they learned anatomy. We were in this together, and together we have co-constituted this new knowledge.

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11.0 APPENDICES

Appendix 1. Student Biographies

I have been very open about my relationship with these students. I have known them all their podiatry undergraduate life and have taught them in various settings. But my knowledge of them was largely professional, both academic and clinical. I was unaware of the full extent of their upbringings, early education, relationships with parents and siblings, and significant events that had an impact on shaping their lives.

What follows is a biography of each of the students gathered after all research data collection had been conducted and analysed. I had an in depth conversation with Janice and Susie about their lives and they told me what they wished me to know. Richard had moved away from the area by this time and chose to send me a written narrative of his life.

Following each biography, I have written out the extract I wrote after my data analysis for each student. I was trying to capture what learning and applying anatomy had been like for each of them. It was not the phenomenological structure as these were idiographic findings, but they were from my head and my heart at reading the transcripts and trying to put myself in each of their shoes. I hope the reader can see the similarities between the raw passage and the life history, and the raw passage and my eventual phenomenological structure of learning and applying anatomy.

Janice

Janice had a financially comfortable upbringing in a small, traditional village in the 1970's. She was a quick learner and it came easily to her. From an early age she recognised the inequality in education: boys were treated with respect and expected to study science, and girls should choose cookery, needlework and the humanities. She therefore studied two languages and maths, amongst the subjects she took to 'O' level, and sailed her education. She had wanted to take physics and chemistry, but not being pushed academically by her parents and seeing how they felt about their daughter taking 'boys' subjects, she settled for biology. She found it challenging though, failed to apply herself and didn't achieve it.

Janice has an older sister two years her senior, and their relationship has been somewhat competitive all their lives. She grew up emulating and learning from her sister, but she also realized she had surpassed her academically when Janice was sent to the all-girls grammar school in the neighbouring large town, and not the local comprehensive. Janice's social life

blossomed from that point. Although Janice described herself as determined and single minded, she also respected that her mother did not want her to be different. So Janice's preference for science, boys' games and the desire for a chemistry set at six years old were set aside. Janice has always felt regret for this diversion from her aspirations and the delay in her discovering her preferred sexuality.

Janice was a sporty teenager. She swam competitively, road cycled and mountain biked, scuba dived and could put her mind to almost any sport. She was admired by peers who gravitated to her socially. She is also a keen hobbyist. From collecting caterpillars and other garden items as a child, to learning Flamenco Guitar today, Janice has always kept herself busy and engaged.

At eighteen Janice broke her neck in a bicycle accident. She spent months recuperating and has always felt sobered by her escape from paralysis or even death. The time was pivotal for her, as it moved her away from reading for a degree in Spanish or business studies, to being accepted at Plymouth to study psychology and sociology. During that time she felt liberated as a person and increased in confidence. She took a twelve month sandwich course to America which enriched her life through the experience of intellectual challenge, and sexual and cultural equality.

On finishing her degree, she moved to another big town and started a twenty one year career in various social work settings, always with people with mental and physical disabilities. At one point she became the social services manager, but it took her away from the reality of working with individual clients, so she reverted back. During these years she studied a level 3 anatomy and physiology course, massage therapy and reflexology at college, but came to the decision that they were not in depth enough for her and she had become far more inquisitive about science and clinical care work. She therefore enrolled onto the podiatry course at Brighton.

Janice has reflected on her upbringing and can see that the issues of inequality she suffered as a child are not the same today. Indeed girls are now encouraged to take maths and science, and there is not the competition she encountered between the sexes. She was embarrassed by her intuition for maths and did not identify with the other 'swatty' children in her class. She recognises that she sailed through school, preferring to make minimal effort and socialize instead. Now she feels comfortable in her own skin she takes pride in studying hard, focusing her attention, and wanting to understand the science of life.

She practices meditation and mindfulness and recognises the calm it has brought to her life. She has a good sense of morality that keeps her principles intact. She explains it as being spiritual, of having and providing opportunities for all and stamping out discrimination of every kind.

Janice is now very confident about herself, her capabilities and her desire to learn. She is self-analytical so is completely aware of her motivations and her limitations, and works diligently to overcome obstacles that interfere with her determined path. She has embarked on a new 'scientific' route of podiatry and knows it can keep her in learning for as many years to come as she chooses. She describes it as a 'step forward and a step up'.

What has learning and applying anatomy been like for Janice?

From Janice's life-world, learning anatomy has been an emersion into a world of form. She learns 'inside' herself. She is aware of her place in space, but experiences deep emersion and is consumed by it. She gets lost in it, likes doing it as a hobby, and is fully focused on anatomy. It holds a fascination for her. Janice dislikes inequality in learning, but mostly if the situation is of her being smarter than others. She is fine with it if it is the other way around and actually embraces this. She is naturally interested in anatomy and likes visualisation, for instance three dimensional models. Janice knows how she learns and uses that to her advantage. Janice is confident academically through her previous degree and working life. Janice has experienced lots of inequality and tries to redress the balance. She is focused, motivated and driven and dislikes time wasting or the feeling that she missed opportunities. Consolidation is time dependent; capture it and don't delay. Janice is not pretend, roleplay, image, trial and error, hypothetical, a theorizer. She is concrete, steadfast, genuine and honest. Janice is ready for learning by being prepared and in the zone. Janice is a reflective person. Janice experiences applying anatomy to practice through a mix of independence and dependence. She feels learning as an obligation, an ethical and moral practice, a sense of responsibility. She needs to put theory into practice relatively quickly for anatomy to make sense. Janice sees the change in supervision as recognition by her lecturers that learning has taken place and she has an elevated status from last year. With that comes responsibility to know anatomy and care for the patient. Janice uses Apps as instant access; she will not time waste - 10 minutes here, 20 minutes there. Always learner-ready...

Richard

Richard was born premature and had a fragile start to his life. Having survived, he was an only child to parents who loved him, but who spent a good deal of his childhood abroad on business. They were both very important people in society, had impeccable manners and very high expectations of their son.

Richard began his education in a preparatory school where catechism and Latin joined maths, English and history as subjects taught. He then used his Latin to get into a grammar school, not very far away from his parental home, but where he boarded. With his parents being absent much of the time, his visits home were generally to his maternal grandmother who became a mainstay in his life. Richard does remember that his paternal grandfather was a judge at the Colonial Central Courts in Bombay (Mumbai) and that on a rare visit there when he was very young, Richard nearly died from burst appendicitis.

The grammar school was an exemplary one, but harsh for a quiet, shy and vulnerable child. He was quite a speedy learner, but an independent one. Looking back this was probably out of a sense of insecurity, not wishing to expose what he didn't understand for fear of ridicule. He believes he still learns independently today, but now it is for fear of misleading peers if he is incorrect in his understandings.

Richard's grandmother died of cancer when he was in his mid-teens. This shook Richard deeply, and it was then that he decided he wanted to study medicine. His father would not hear of it, however, and demanded Richard followed his footsteps into the Law. In hindsight, Richard said it was out of loyalty, respect and a sense of duty that he turned down the place he had secured at the London Hospital, but at the time Richard was headstrong and refused to go into the Law straight away. Having pursued a hateful job as a stock broker, Richard finally relented and went to university to study Law.

Richard took the Bar, and through a number of some eminent, and some ruthless city jobs in chambers in London, climbed the ranks of banking and tax law. He was in an aspect of law practiced by very few people and he continued to do so for twenty four years. He always felt overshadowed by his father though. If he did something well, it was often said it was because of his father. If it went less well it was because 'he is not like his father!' Eventually, he had the courage and opportunity to change direction to his original interest, and pursued a medical discipline.

Richard chose podiatry because of his interest in the lower limb; how it moved and how diseases manifested in it. To secure a place, he embarked on an MSc Psychology module to

gain academic credibility, and began volunteering at the care home for people with Huntington's syndrome. He met a podiatrist there and his choice of new career was confirmed for him.

On the subject of reflection, Richard did not know of it when in the law. It was not taught, nor openly practiced by any of his colleagues. For him, the principles of law, its rules and the application of caselaw didn't require him to think about what he thought about the process, whether he could have taken a different approach, or why he did as he did. He has since shared the practice of reflection with an old, revered colleague, a Head of Chambers, and both do feel reflection would have benefited the practitioners of law.

Richard's mother was also prominent in his life. She was a linguist with the Foreign and Diplomatic Office and although travelled away a good deal, Richard and she were still reasonably close. She had respected Richard's decision to go into medicine and indeed supported him. She died in 2007 and Richard was sorry she had not been a part of his career change. She would have enjoyed to see him happy.

What has learning and applying anatomy been like for Richard?

Richard remembers anatomy from when he was younger. He gets flashbacks - a diagram, an anatomical feature. He grasps lectures quickly, but the pace in time and complexity of his new experiences is a challenge. He calls it 'keeping his mind up to speed'. For Richard, learning anatomy in the classroom is an exercise in faith; a ritual or a religion. Dissection made it a little more real, and making models out of plasticine 'plugged it into his memory'. He sees books as the magic, the cadaver as the reality. He sees the law as using the head and voice, and podiatry as the hands and writing. For Richard, the human form is a feat of engineering - parts, a form, a function as a whole but each bit is essential. Richard uses his own body to help him understand anatomy - tactile, creative, feeling size and strength. This is an embodied experience. Richard likes to relate anatomy to the ordinary things of his understanding - an orchestra, engineering, a roadmap, a taxi driver. Richard is divided about group work. It can be helpful for sharing, comparing and seeing new views, but it can also be confusing, detracting and distracting. Richard is methodical and logical. He plans his communication and needs to say it uninterrupted. He likens it to a court, with a judge who listens. If his thoughts and flow are 'ambushed' he loses his thread. He is systematic in his approach, enjoys anatomy terminology and uses clinical reasoning to work with meaning. Richard recognises 'expertise' when he sees it. It is impressive and he strives for it. He is insightful.

Susie

Susie was born and grew up in a small village consisting of estate workers cottages, and twelve council houses. She lived in the latter. The neighbouring village was the same, but her village had a reputation for the villagers being unintelligent. Susie called it the 'working class village'. Her village school closed, so she was subjected to going to the 'slightly better' neighbouring one. She feels her education was a cruel experience of harsh punishment and inequality, amounted to nothing, and that by the time she went to comprehensive school she was well behind in her learning. She has carried this feeling of inferiority and of being somehow lesser than others with her all her life.

She was in the subject middle sets for her comprehensive education. She didn't believe in herself though so put little effort into learning. She would skip school regularly - no-one was checking that she was there. She was different to the other children; more bodily mature and taller, and sportier. She was teased for her difference and she considered herself a 'freak'. It wasn't until she was mid-teens that she decided to go into the army and be a nurse. She needed biology and geography for that, so she started trying hard at those subjects.

Susie was close to her father, but he was very ill all her childhood life. Her mother spent all her time caring for him, and holding down three part time jobs, and had little time left for her children. When her mother learnt that Susie wanted to join the army she told her that she shouldn't leave her father, so Susie didn't go.

Susie left school with nothing to show for it. She moved out of the family home as soon as she could at sixteen into a shabby bedsit and joined a Youth Opportunities Scheme. She worked relentlessly just to pay her rent and feed herself. She met a youth, the same age as her, and they moved in together. It was an unequal relationship, but they stayed together for eleven years. While still only eighteen, Susie joined Scholl, a company teaching podiatry (chiropody, as it was then) to a basic level but with very high standards and for a small amount of pay per patient. She saw a huge diversity of patients and performed a variety of skills. As before, Susie worked very hard and did so well that she got a job on a cruise ship as their chiropodist. She turned it down when she heard that she would have to dress herself up every day; her mother called make-up 'muck' and would ridicule her daughter if she wore it, which gave Susie feelings of being freakish in make-up.

After eleven years with her boyfriend and being made to feel worthless and insecure, he severed the relationship. One of Susie's friends persuaded her to backpack the world together but after the friend dropped out of the trip, Susie went alone. This was a huge deal for Susie.

But for fourteen months she felt liberated and worth something, until she ran out of money and had to return home. At thirty one, she worked with Scholl again for several months, this time teaching others the skills of podiatry. It was only a temporary measure though, because she wanted to do a nursing course. Without any qualifications, her entrance exam was a UKDC test, which she passed, so she enrolled the next summer. On qualifying with a diploma, she got a job on a renal ward and has pretty much remained in renal nursing since. There were a few changes: she topped her diploma up to a degree, she took a sabbatical to New Zealand nursing amongst the Maori, became a clinical nurse educator for a year, and she enrolled on an MSc but didn't finish it.

Susie has had to cope with unreasonable expectations of her all her life. At school she was more mature in stature than her peers and they expected her to have been more intelligent than them. As a nurse educator she was away from the patients and was expected to teach small classes, which she disliked. On the MSc she was expected to teach large classes of students and she felt she was not suitably skilled to do so. Lastly, on the podiatry course she was a nurse already so felt people expected her to be better at podiatry than them. But she has always owned up to any incompetence and has never tried to hide them. She has never felt superior and would never act so.

Susie is a character of contradictions. She has two degrees, started a Masters, was head hunted for various jobs, taught in various environments and has expertise in two specialist subjects. She has been independent, travelled, educated and respected as a clinician. Yet she displays vulnerability, lacks confidence, belittles herself and berates herself for 'letting people down'. Susie's is a narrative of dichotomy and paradox.

What has learning and applying anatomy been like for Susie?

Susie has been a renal nurse for many years but still feels uneducated. She has largely taught herself so does not class this as 'academic'. She sees the link between the renal foot and the diabetic foot and wants to pursue this aspect of the career. She feels that others have high expectations of her because she is a nurse, but she has not studied anatomy before so feels as new as them. Susie confesses that she is assessment driven and up to now has only seen the point of learning if it is for some external goal. Susie is a practical person who likes repetition and relevance, and wants to be directed in her learning. She enjoys that kind of structured approach. Susie appears accomplished in her skills of patient care: communication, vascular and neurological assessment skills and the values of caring (particularly compassion). However she works differently to others I have seen and this gives

the appearance that she is a novice. This creates in her a vulnerability which clouds everything she says and does. Susie is worried about being exposed, but she has years of clinical experience and is only a novice in certain aspects of podiatry. Indeed it feels more that she has skipped the novice stage and has gone straight to proficient. Would this explain her difficulties with learning? Is learning this way round somehow undermining? The curriculum is designed to be linear. Perhaps PBL would have suited Susie better. Susie sees anatomy as a brain type - the MSK one, the renal one, the wound care one. Perhaps Susie feels set apart from the 'degree gang' - the culture of these students she works alongside. She does approach her learning differently from many of them. She seems embarrassed by this, as if she has somehow failed, or is substandard. Susie's life world must be exhausting. Susie feels 'deskilled'. She feels undervalued as the professional she is because she is back to being a student. This has been undermining. The crazy thing is, Susie knows she is right!

Appendix 2. Ethics approval (original in colour)

From: Sara Bragg
Sent: 28 June 2016 11:30
To: Maria Birch
Subject: Re: ethics

Dear Maria

Yes, you can take this as confirmation that your ethics application has been scrutinised and approved.

Thanks and good luck!

Best wishes

Sara

Dr Sara Bragg
Principal Research Fellow
Education Research Centre

From: Maria Birch <M.Birch2@brighton.ac.uk>

Date: Tuesday, 28 June 2016 11:25

To: Sara Bragg <s.bragg@brighton.ac.uk>

Subject: RE: ethics

Sara,

Am I now to assume my ethics has been accepted? Could I trouble you to write me an email to say this? I would like the final confirmation for my file.

Very many thanks

Maria

From: Sara Bragg
Sent: 28 June 2016 10:40
To: Maria Birch
Subject: Re: ethics
Thanks Maria

I can see you are thinking really carefully about all these issues, which is exactly what's wanted (it's not about 'solving' them neatly).

Best wishes

Sara

Dr Sara Bragg
Principal Research Fellow
Education Research Centre

From: Maria Birch
Date: Tuesday, 28 June 2016 10:24
To: Sara Bragg
Cc: Keith Turvey, Phil Mandy
Subject: RE: ethics

Dear Sarah

Many thanks again for reviewing my ethics application.

I enclose my responses to each of your queries and am happy to provide more should you wish.

Dear Sara

Many thanks for reviewing my application for ethics through the Tier 1 process. I enclose here the revisions and/or comments to respond to each of your points below.

There were aspects of the form as an ETHICS application that were a bit unnecessary – really, for a reader, you only need to cut to the chase and identify the ethical issues, not explain the whole philosophy behind it!! Be kind to them, make their / our life easy. That's a general point about what ethics panels look for, so as much for your supervisors to note for next time, as you.

Many thanks for this constructive comment. As a researcher and lecturer in the School of Health Sciences, I am used to a really often overly rigorous system of ethics scrutiny and as such, have tended to put in too much than be asked for more later. I apologise for expecting the same from you and for not asking for guidance from the Education School earlier.

There is no discussion of the ethics of observing practice in the hospital. Won't you need permission of a gatekeeper, are there issues there to do with observing patients and getting their permission, possibility of observing poor practice etc? Sorry if that just shows I don't really understand podiatry or the context – do explain it to me. I appreciate that this is a really important aspect of the research, much more so in fact than the interviews which are limited in what they can show, so would want to support it, but it may need a bit more thought / attention ethically. Keith has suggested this is a newer element, which may be why it is less developed.

You are so right to ask me this and it has made me reflect more closely and in more detail on what I wish to gain from these observations, and the process I will need to go through.

My need to do observation has become far more integral to my research now. I am interested in the use of anatomy knowledge of my student participants in a practice setting, which is all bound up in watching their skills of podiatric assessment, listening to their interactions with the patient and the practitioner supervising, and their decision making and actions in regard to managing the patient's condition. This will give me a richness of data the interview alone cannot, through observing and recording participant actions, speech, cues, pauses, and skills demonstrations. To capture this longer term, I would like to record it using an iPad. I will gain participant, patient and supervising practitioner consent, the recordings will be password

protected, kept on my own computer, only viewed by me, and deleted after the research has concluded. A pseudonym will be used to name the file.

The protocol for research observation laid down by the Professional Lead for Podiatry at the Leaf Hospital, will be followed. My focus is on the participant and not the patient or supervisor, but consent will be gained from all. Patient consultations take part in a small cubicle within a larger clinic (up to 6 cubicles). The patient sits on an operating couch, the student on a practitioner chair facing their patient but situated at their feet. I will sit behind and to the side of the patient, facing the student and in full view of them. The patient will know I am there but will not be able to see me. I will be supernumerary to the supervising practitioners. If an issue of a possible compromise in patient safety is observed, if it was an immediate need such as a patient needing emergency assistance, or a student about to perform an unsafe act, I would intervene myself. Otherwise I will call upon the supervising practitioner to address the practice, as is normal practice in this podiatry clinical teaching environment.

I acknowledge I am inexperienced in research observation. To address this I am attending a Doctoral Study workshop next Thursday, 30th June, to learn how to conduct an observation, doing extensive reading on the subject, and speaking to researchers who do have experience. I will then practice the technique prior to conducting the research.

I do have some concern about the small numbers of interviewees, esp as these are ones you have already interviewed. There is the possibility that this will be experienced by other students as creating an in-clique. Although you have stated exclusion criteria, potentially there are more than 3 students who might want to be interviewed, are you prepared to interview them all? If not, how will you explain not doing so to them?

I would like more of a rationale for the tiny number of interviewees. That is about research credibility as much as ethics, although in my view the two are related. With the observations of practice you will have more of a doctoral study, however.

The observation of these three participants is now of greater significance and therefore should produce a richness of data not expressed in my original ethics application. For each of the three participants I will have three interview transcripts: one from the previous research and two from this study. I will also have a substantial amount of observation data from the clinical setting. In addition, if the interviews highlight other contexts flagged as influential for the participant's learning of anatomy, there will be additional observation data. However I acknowledge the research is at risk if enough data is not collected. So, once all this has been collected, it will be clear to me if I am still seeing and hearing new data or whether I am getting only repetition. If the former, then I will make the decision to interview and observe more participants and will do so for as many as come forward and consent.

The importance to me of interviewing and observing my original three participants is so I have an historical perspective. I believe my data will be all the richer for this. The duration of

observation is dependent on clinical activity level and may require up to two days of observation for each participant.

To mitigate against the issues you foresee with the remaining students of the cohort possibly questioning my professional distance to the three participants, I will speak to the whole cohort prior to data collection to explain the research and ensure they do not feel the three participants are somehow gaining extra tuition or are having an experience of anatomy learning not open to them.

Is there a timing issue in relation to assessment? Can you interview them beyond any time when you are assessing their work? If anonymous marking is the norm, you need to say this – as is the form almost implies to a reader that * only * your interviewees' work will be anonymously marked, which would be ridiculous! The form seems long on the 'I'm terribly concerned about this and doing my best' rather than actual procedures in place that might reassure students e.g. that their interviews won't affect their marks.

There is no timing issue related to assessment as all data is likely to be collected prior to assessment submission. In addition, I will not have a module assessment being submitted by this cohort. As you quite rightly point out, all written work for all students is submitted via turnitin and anonymously marked, not just for my participants. Assessment for some modules in which I am involved is also by way of clinical exams, practical exams and viva voce, and I will not be assessing any of my participants in these circumstances. Participation in my research will not in any way bias towards or against the participants in any regard.

Best wishes

Maria

From: Sara Bragg
Sent: 08 June 2016 09:28
To: Maria Birch; Maria Birch
Cc: Keith Turvey; Phil Mandy
Subject: ethics

Dear Maria

Thank you for working hard on your ethics application. I can see you have thought carefully about your relations with research participants.

I would make the following points.

- there were aspects of the form as an ETHICS application that were a bit unnecessary – really, for a reader, you only need to cut to the chase and identify the ethical issues, not explain the whole philosophy behind it!! Be kind to them, make their / our life easy. That's a general point about what ethics panels look for, so as much for your supervisors to note for next time, as you.
- there is no discussion of the ethics of observing practice in the hospital. Won't you need permission of a gatekeeper, are there issues there to do with observing patients and getting their permission, possibility of observing poor practice etc?

- Sorry if that just shows I don't really understand podiatry or the context – do explain it to me. I appreciate that this is a really important aspect of the research, much more so in fact than the interviews which are limited in what they can show, so would want to support it, but it may need a bit more thought / attention ethically. Keith has suggested this is a newer element, which may be why it is less developed.

- I do have some concern about the small numbers of interviewees, esp as these are ones you have already interviewed. There is the possibility that this will be experienced by other students as creating an in-clique. Although you have stated exclusion criteria, potentially there are more than 3 students who might want to be interviewed, are you prepared to interview them all? If not, how will you explain not doing so to them?

- Is there a timing issue in relation to assessment? Can you interview them beyond any time when you are assessing their work? If anonymous marking is the norm, you need to say this – as is the form almost implies to a reader that * only * your interviewees' work will be anonymously marked, which would be ridiculous! The form seems long on the 'I'm terribly concerned about this and doing my best' rather than actual procedures in place that might reassure students e.g. that their interviews won't affect their marks.

- I would like more of a rationale for the tiny number of interviewees. That is about research credibility as much as ethics, although in my view the two are related. With the observations of practice you will have more of a doctoral study, however.

I hope this is helpful. If you want to talk through any aspects of the observations etc do let me know.

Good luck with it.

Sara
Dr Sara Bragg
Principal Research Fellow
Education Research Centre

Appendix 3a. Email to first year podiatry students

Dear year one student

I am undertaking a small research study this semester as part of my Doctorate in Education. I am interested in your experience of learning anatomy on the PP442 MSK 1 module and how my practice of teaching and assessment may have influenced it.

I would like to invite you to take part in my study which will entail an interview of up to one hour at a mutually convenient time and place for you in April or May. It will take place in a research meeting room at Robert Dodd. I will be asking you: What is your lived experience of learning anatomy following the PP442 MSK 1 module?

I recognise that I am your module leader and have taught you most of the sessions for the module PP442. I acknowledge I am also your Course Leader and at present, your Professional Lead. However I firmly believe that all learners have a right to a valued and valuable learning experience and that all facilitators of learning have a moral obligation to strive to provide this. Consequently, I wish to examine my own practices of teaching and assessment and to this end it is unavoidable that I ask you to be my participant. To overcome any issues you may have with this I will ensure I have explained fully the nature of my research and the need for you to be open and honest in your dialogue with me. At this interview I am taking on the role of a researcher, and I would not wish to cause you any discomfort or tension as a consequence of my position within the podiatry team. In addition, to mitigate for any bias against or favour toward you, any future marking of work I will do for the remainder of their year one and for your subsequent years on the course I will do anonymously, it shall be second marked, and it shall be scrutinised by the External Examiner; as is the normal practice of the University.

If you would like to take part, please indicate this by replying to this email by 10th April. A participant information sheet is included for more detail.

Regards

Maria Birch, Student of a Doctorate in Education

Appendix 3b. Email to the 3 third year podiatry students who took part in the original study

Dear 'name'

Thank you for taking part in my original small scale study into students' experiences of learning of anatomy. I am now progressing this work, and undertaking a more substantial research study as the thesis element of my Doctorate in Education. I now wish to examine more closely the ways in which students develop their anatomy knowledge and apply it in the clinical setting. I would like to invite you to take part in my study which will involve two activities:

1. An observation and video recording of two sessions of you in practice: one of a general clinical and one of a musculoskeletal clinic. This will take place in the Leaf Hospital clinical setting.
2. Following the observations, an interview of up to one hour at a mutually convenient time and place for you in February, March or April 2017. I will be asking you: 'What is your lived experience of learning and applying anatomy?'

I recognise that I am your anatomy tutor and have taught you most of the anatomy content. I also acknowledge I am your Course Leader. However I firmly believe that all learners have a right to a valued and valuable learning experience and that all facilitators of learning have a moral obligation to strive to provide this. Consequently, it is unavoidable that I ask you to be my participant. To overcome any issues you may have with this I will ensure I have explained fully the nature of my research and the need for you to be open and honest in your dialogue with me. At this interview I am taking on the role of a researcher, and I would not wish to cause you any discomfort or tension as a consequence of my position within the podiatry team. In addition, to mitigate for any bias against or favour toward you, any future marking of work I will do for the remainder of your degree I will do anonymously, it shall be second marked, and it shall be scrutinised by the External Examiner; as is the normal practice of the University.

If you would be willing to take part, please indicate this by replying to this email as soon as possible. You will always have the right to withdraw at any point in the future. A participant information sheet is included for more detail. My supervisors' contact details are also enclosed should you be concerned in any way about this research.

Regards

Maria Birch, Student of a Doctorate in Education

Appendix 4a. Participant information sheet for first year students

Participant Information Sheet

1 Study title

What is the lived experience of learning anatomy through the following the PP442 MSK 1 module?

2 Invitation

I would like to invite you to take part in a research study. Before you decide you need to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully. Talk to others about the study if you wish. Ask me if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

3 What is the purpose of the study?

This study will seek to understand the experiences of a small sample of first year students on the undergraduate podiatry degree. The interest is in how the students describe their learning and draw meaning out of their experience.

4 Why have I been invited?

You have been invited to take part in this study because you are a first year student of podiatry at the University of Brighton.

5 Do I have to take part?

It is up to you to decide. I will describe the study and go through this information sheet, which I will then give to you. I will then ask you to sign a consent form to show you have agreed to take part. You are free to withdraw at any time, without giving a reason.

6 What will happen to me if I take part?

The study will be an interview of up to one hour at a mutually convenient time and place for you in March or April. I will be asking you: 'What is your experience of learning anatomy following the PP442 MSK 1 module?'

For privacy the interviews will take place in a quiet location. The interviews will be recorded on a small digital recorder. For confidentiality names will not be used; instead each participant will be given a pseudonym.

I recognise that I am your module leader and have taught you most of the sessions for the module PP442. I acknowledge I am also your Course Leader and at present, your Professional Lead. However I firmly believe that all learners have a right to a valued and valuable learning experience and that all facilitators of learning have a moral obligation to strive to provide this. Consequently, I wish to examine my own practices of teaching and assessment and to this end it is unavoidable that I ask you to be my participant. To overcome any issues you may have with this I will ensure I have explained fully the nature of my research and the need for you to be open and honest in your dialogue with me. At this interview I am taking on the role of a researcher, and I would not wish to cause you any discomfort or tension as a consequence of my position within the podiatry team. In addition, to mitigate for any bias against or favour toward you, any future marking of work I will do for the remainder of their year one and for your subsequent years on the course I will do anonymously, it shall be second marked, and it shall be scrutinised by the External Examiner; as is the normal practice of the University.

7 What will I have to do?

You will attend one interview of up to one hour.

8 What are the possible disadvantages and risks of taking part?

Occasionally an interview may throw up sensitive or controversial issues, so there is a possibility you may become emotionally charged. The researcher will be sympathetic and compassionate to you if you are expressing any material of this nature, and following the interview will conduct a debrief. This may include seeking or signposting to help, support or guidance from external agencies as necessary.

9 What are the possible benefits of taking part?

This research is principally to understand any influence my teaching and assessment practice may have on a student. It is therefore not anticipated that any generalisations will be developed therefore public dissemination of outcomes is therefore unlikely to result. However it is anticipated that the results will inform future practice in the module PP442 MSK 1 and possibly other modules on the BSc (Hons) Podiatry programme.

10 What if there is a problem?

Any complaint about the way you have been dealt with during the study or any possible harm you might have suffered can be addressed by contacting my supervisor. For contact details see the bottom of the information sheet

11 Will my taking part in the study be kept confidential?

Whilst not in use the digital recorder and any written transcript will be kept under lock and key, whilst any data saved to the computer will be password protected. All data will be kept confidential and will not be used to disadvantage or advantage any participant whilst they are on the course. Only the researcher and supervisor will have access to view identifiable data. Data will be retained for five years before being disposed of securely.

12 What will happen if I don't want to carry on with the study?

If you don't want to carry on with this study, you may withdraw at any time and without giving a reason. Should you withdraw from the study, the data collected up to that point may be used by the researcher for the purposes described above.

13 What will happen to the results of the research study?

It is not intended to publish the results of this study, but it will inform a larger project which may be published. You will not be identified in any report or publication.

14 Who has reviewed the study?

This study has been reviewed and approved by the School of Education Research Ethics and Governance Panel, University of Brighton.

15 Contacts for further information

Maria Birch, Student of a Doctorate in Education
m.birch2@brighton.ac.uk
Keith Turvey, Supervisor in School of Education
k.turvey@brighton.ac.uk

Thank you for considering taking part in this study.

Appendix 4b. Participant information sheet for third year students

Participant Information Sheet

1 Study title

Learning and applying anatomy for podiatry practice: the lived experience.

2 Invitation

I would like to invite you to take part in a research study. Before you decide you need to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully. Talk to others about the study if you wish. Ask me if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

3 What is the purpose of the study?

The purpose of this study is to illuminate the student experience of the ways in which they make sense of anatomy learning and how they use anatomy in clinical practice. By generating this scientific knowledge, this study should expand on current thinking of learning anatomy, reveal an understanding of the experience of how students learn and apply anatomy in clinical practice, and offer insight into this phenomenon through an educational perspective.

4 Why have I been invited?

You have been invited to take part in this study because you are a third year student of podiatry at the University of Brighton and because you were a participant in an earlier study by the researcher when you were in year one.

5 Do I have to take part?

It is up to you to decide. I will describe the study and go through this information sheet, which I will then give to you. I will then ask you to sign a consent form to show you have agreed to take part. You are free to withdraw at any time, without giving a reason.

6 What will happen to me if I take part?

The study will be made up of two activities:

1. An observation and video recording of two sessions of you in practice: one of a general clinical and one of a musculoskeletal clinic. This will take place in the Leaf Hospital clinical setting.
2. Following the observations, an interview of up to one hour at a mutually convenient time and place for you in February, March or April 2017. I will be asking you: ‘What is your lived experience of learning and applying anatomy?’

For privacy the interviews will take place in a quiet location. The interviews will be recorded on a small digital recorder. For confidentiality names will not be used; instead each participant will be given a pseudonym.

I recognise that I am your anatomy tutor and have taught you most of the anatomy content. I also acknowledge I am your Course Leader. However I firmly believe that all learners have a right to a valued and valuable learning experience and that all facilitators of learning have a moral obligation to strive to provide this. Consequently, it is unavoidable that I ask you to be my participant. To overcome any issues you may have with this I will ensure I have explained fully the nature of my research and the need for you to be open and honest in your dialogue with me. At this interview I am taking on the role of a researcher, and I would not wish to cause you any discomfort or tension as a consequence of my position within the podiatry team. In addition, to mitigate for any bias against or favour toward you, any future marking of work I will do for the remainder of your degree I will do anonymously, it shall be second marked, and it shall be scrutinised by the External Examiner; as is the normal practice of the University.

7 What will I have to do?

I will observe you in practice on two occasions. Following these, you will attend an interview of up to one hour each.

8 What are the possible disadvantages and risks of taking part?

Occasionally an interview may throw up sensitive or controversial issues, so there is a possibility you may become emotionally charged. The researcher will be sympathetic and compassionate to you if you are expressing any material of this nature, and following the interview will conduct a debrief. This may include seeking or signposting to help, support or guidance from external agencies as necessary.

9 What are the possible benefits of taking part?

It is anticipated that this will add to and enhance the body of knowledge currently established. This enhancement will be for healthcare education, education of pedagogy, and for all disciplines in which application is a major aspect of learning.

10 What if there is a problem?

Any complaint about the way you have been dealt with during the study or any possible harm you might have suffered can be addressed by contacting my supervisor. For contact details see the bottom of the information sheet

11 Will my taking part in the study be kept confidential?

Whilst not in use the digital recorder, video, and any written transcript will be kept under lock and key, whilst any data saved to the computer will be password protected. All data will be kept confidential and will not be used to disadvantage or advantage any participant whilst they are on the course. Only the researcher and supervisor will have access to view identifiable data. Data will be retained for five years before being disposed of securely.

12 What will happen if I don't want to carry on with the study?

If you don't want to carry on with this study, you may withdraw at any time and without giving a reason. Should you withdraw from the study, the data collected up to that point may be used by the researcher for the purposes described above.

13 What will happen to the results of the research study?

It is anticipated public dissemination of outcomes is likely to result through a published paper and possible conference presentations. You will not be identified in any report or publication.

14 Who has reviewed the study?

This study has been reviewed and approved by the School of Education Research Ethics and Governance Panel, University of Brighton.

15 Contacts for further information

Maria Birch, Student of a Doctorate in Education
m.birch2@brighton.ac.uk
Dr Keith Turvey, Supervisor in School of Education
k.turvey@brighton.ac.uk
Dr Phil Mandy
p.j.mandy@brighton.ac.uk

Appendix 5a. Participant consent form for first year students

Participant Consent Form

What is the lived experience of learning anatomy following the PP442 MSK 1 module?

- ◆ I agree to take part in this research which is to investigate the experience of the teaching and assessment practices by year one undergraduate students of podiatry.
- ◆ The researcher has explained to my satisfaction the purpose, principles and procedures of the study and the possible risks involved.
- ◆ I have read the information sheet and I understand the principles, procedures and possible risks involved.
- ◆ I am aware that I will be required to attend an interview in the next two months.
- ◆ I understand how the data collected will be used, and that any confidential information will normally be seen only by the researchers and will not be revealed to anyone else.
- ◆ I understand that I am free to withdraw from the study at any time without giving a reason and without incurring consequences from doing so.
- ◆ I agree that should I withdraw from the study, the data collected up to that point may be used by the researcher for the purposes described in the information sheet.
- ◆ I agree that my spoken word may be used as verbatim quotes in the final write-up

Name (please print)

Signed

Date

Appendix 5b. Participant consent form for third year students

Participant Consent Form

What is the lived experience of learning and applying anatomy?

- ◆ I agree to take part in this research the purpose of which is to illuminate the student experience of the ways in which they make sense of anatomy learning and how they use anatomy in clinical practice.
- ◆ The researcher has explained to my satisfaction the purpose, principles and procedures of the study and the possible risks involved.
- ◆ I have read the information sheet and I understand the principles, procedures and possible risks involved.
- ◆ I am aware that I will be observed and video recorded in practice, and be required to attend two interviews over the next two months.
- ◆ I understand how the data collected will be used, and that any confidential information will normally be seen only by the researchers and will not be revealed to anyone else.
- ◆ I understand that I am free to withdraw from the study at any time without giving a reason and without incurring consequences from doing so.
- ◆ I agree that should I withdraw from the study, the data collected up to that point may be used by the researcher for the purposes described in the information sheet.
- ◆ I agree that my spoken word may be used as verbatim quotes in the final write-up

Name (please print)

Signed

Date

Appendix 6. An example of part of a transcript being divided into meaning units using a /

Susie: I have thought about it overnight and I've looked back on it and I've thought 'urggh, I always do the same thing in my head/ for example Stewart was asking me questions about hammer toes, claws toes, I go " I don't know..." I do know....why does that impact my brain... I do know....why do I do that? I don't know (groan). So I've thought about those./ I've thought about an incident where I noticed the patient hadn't had a musculoskeletal assessment so I went and got the form, faffed around and didn't finish it off. Why, I don't know why, why didn't I.../what was going through my mind was panic, when I was asked a question. Um...

Researcher: Can you describe 'panic' for me?

Susie: I think it's because its terminology..... Um, so when he asks the question in a different way, what would you expect with a claw toe? And I said 'callus on the apex' and 'pressure on the IPJ', I think 'why am I calling it a hammer toe?'. So I think it's the way the question's worded, maybe./ And the way I panic, and say 'oh my god, I'm supposed to know that terminology, what is it? And then I start with my fingers, trying to work it out... what's doing what.... Yeh, panic with terminology. Panic for getting it right. Panic for being stupid. /I'm a visual person, I think. So now, because that's how I learn, so he's worded it in that way, 'what conditions would you expect, with a claw toe', or something, that will stick with me forever now because I visualised what he was saying.... what he was trying to make me to say for myself in a real person, with the condition. Do you see what I mean? I ... so he's making me.... the woman's got what I'm saying. So he's pointing out...making me point out to myselfwhat it is. You know, use your nozzle Susie, look at what you've got in front of you. And then once he said.... that penny dropped, yeh, of course./It's about experiencing something, seeing something in action, and realising maybe that wasn't 'right', thinking 'what should have happened?' So I now know that mistake will never be made again because it's up here (pointing to head). In the brain./ I think I look at the long term bigger picture. I don't just think of the here and now. I think of the effects long term./So I have concern for the patient. So how am I going to prevent anything detrimental happening to the patient. So how am I going to prevent that/ So my way of learning is seeing a situation, for example yesterday with the claw toe (I'm doing it again, showing you a claw toe...) I'll always remember now...that's a claw toe....I'll think about the bigger picture, how we can prevent the corn on the apex... the pressure on the (IPJ)... cos I've seen it in action, I've seen people's in action and I look ahead./I've thought about the dissection and I almost think

that would be more relevant now. In the first year I didn't understand what I was looking for. So you see the muscles, you're pointing out what they do, but because I haven't seen it in a real person.. in a living specimen, or the effects of it, it didn't really mean anything./ Whereas if, now, in my third year when I've seen the conditions and I've seen the muscles and I've seen the effects of what happens to them, looking at the dissection now would make far, much more sense, because I can relate it to reality./ Yeh, I like those cos it's like a puzzle and you have to work it out. What goes what, so I like that. /I always believe there is a cause and I feel you need to find a cause. So that's almost like a puzzle, isn't it. You've got to find out why.../yeh, so whenever I've got a consequence, I need to know why so I find it easier to question history taking, and go backwards. What's happened, what's led to this, what conditions have they got, you know....rather than trying... look at something, and academically work it out without all of that./ I like stepping up to the plate...in the real world, you know. /I love clinic. Its where I feel happy....happier, happiest. Getting on with it.