Abstract

Objective
The aim of the study was to gain insights into students’ lived experiences of learning human anatomy, as part of an undergraduate Master of Pharmacy (MPharm) programme in the United Kingdom. Our objective was to explore student experiences using qualitative interviews and thematic analysis to identify what was learned and how it was learned.

Methods
The study used a transcendental phenomenological design. Data was collected using semi-structured individual interviews using a schedule, which were audio-recorded and transcribed verbatim. Participants included MPharm students at the end of their first year or the beginning of their second year. Thematic analysis was used to identify structural and textural components of participants’ experiences using data management software, NVivo, Version 11.

Results
Sixteen participants were recruited and interviewed. Students described developing an understanding of anatomy that differed from their previous experiences, focusing on variation between anatomical structures between patients, and developing professional attributes such as empathy and respect. Students described haptic learning that acted as a hook to anchor additional learning from textbooks and lectures. Finally, students articulated a perceived value of their learning for their future careers as caring professionals.

Conclusion
The results of this qualitative study demonstrate the value of teaching anatomy to undergraduate students goes beyond developing a broad knowledge of anatomical structures, but also engages a deeper conceptual appreciation of professionalism, inducting them into a community of professional practice.
Introduction

The role of anatomy teaching in the undergraduate education of health professionals has a long and distinguished history. From the start of the 20th Century, the preclinical education of medical students consisted almost entirely of anatomy teaching occupying between 500 and 1200 hours of direct instruction time, depending on the specific institution. This approach continued well into the mid 1930s whereupon calls for greater integration of science and clinical practice stimulated a reduction in anatomy teaching hours. This reduction has continued to cause some researchers to suggest that the depth of anatomical knowledge is suboptimal. Unrelenting debate surrounds the format of delivery for the remaining anatomy instruction time, with dissection-led programmes and problem-based teaching courses presenting the two extremes of a traditionalist versus modernist educational continuum.

Anatomy teaching within undergraduate pharmacy is often undertaken as part of preprofessional education programmes or integrated within physiology teaching. The General Pharmaceutical Council, the regulator of the pharmacy profession in the United Kingdom, does not specifically detail anatomy within their outcome-based educational standards. Whilst this arguably generates greater flexibility and heterogeneity in pharmacy education as a consequence, there are few UK programmes that include specific practical anatomy courses within the Master of Pharmacy (MPharm) programme curriculum. Despite this, recent evidence has identified that pharmacists are increasingly involved in ‘body work’ – a term used in medical sociology that posits the body as an object of labour and used recently to describe the inclusion of the body in pharmacists everyday work, such as during clinical assessment and clinical decision making. In many instances, the skills pharmacists use when working with patient bodies are predicated on a knowledge of anatomy; the location of systems and organs within the patient to identify, monitor and treat diseases using
pharmacotherapy. Pharmacy degree programmes must respond to the realities of practice, as pharmacists become increasingly involved in monitoring medicines use and patients’ bodies.

In October 2013, the first students where recruited to a new anatomy course within an MPharm programme. The programme takes an integrated approach to teaching anchored to clinical cases, incorporating science and practice within problem-based teaching. Included within the first semester is a bespoke practical anatomy course where first-year students, through a series of sessions, are supported by lectures to explore cadaveric specimens including whole cadavers and prosections. These sessions are designed around the eleven anatomical systems and are aimed at providing fundamental knowledge in the context of pharmaceutical sciences, which will support much of the physiological and pharmaceutical material that follows in the latter years of the MPharm. The importance of a solid understanding of anatomy should not be understated: a deep learning approach to clinical skills, pathophysiology and therapeutics is predicated upon a thorough understanding of the underlying structures of the human body.

Little is known about pharmacy students’ experiences of anatomy teaching, what they learn and how they learn anatomy. We wanted to gain a better understanding of how students experience the sights, smells and emotions of practical anatomy sessions and if they develop a conceptual appreciation of the anatomy of the body as a whole and of individual organs therein. This is important to understand as pharmaceutical education increasingly focuses on clinical pharmacy practice, whereby the bodies that pharmaceuticals are developed to influence and used on are drawn into the foreground of pharmacy practice. The aim of this study was therefore to explore what was learned and how it was learned to inform the process of refinement of the content of the course, in future.
Method

The methods for this study were underpinned by a transcendental phenomenological approach. The philosophical background of this perspective argues that reality is constructed from subjective consciousness, interpreting the objective world, as a lived experience. Phenomenology offered the most appropriate theoretical approach as the study sought to explore the nature of students’ lived experiences of a programme of teaching and how they subjectively interacted with an objective teaching platform. A phenomenological framework also facilitates the identification of previously held beliefs that enable researchers to identify, reflect on and take account of, their own role within the data collection and analysis process. As part of this approach, researchers are encouraged to reflect personally and as a group to identify their assumptions, biases and previously held beliefs in a process known as épcohé, to improve transparency of qualitative research.

MPharm students who had completed the anatomy course in the same academic year who were at the end of their first year or the start of their second year of the MPharm programme, were invited to take part in the study. A convenience sample was used as a pragmatic approach to recruit a range of students. Participants were recruited via an emailed invitation including a participant information leaflet and a consent form, which was circulated to the entire cohort. Informed written consent was taken from each participant prior to his or her involvement in the study. Participants were assured that their identity would remain confidential and were given a unique participant identification number. Recruitment took place until theoretical data saturation was reached (ie when no new ideas or themes were emerging from the interviews, and this was judged by three researchers (APR, AT and AH). As part of this approach, researchers are encouraged to reflect personally and as a group to identify their assumptions, biases and previously held beliefs in a process known as épcohé, to improve transparency of qualitative research.

In-depth, semi-structured individual interviews were conducted and guided by an interview schedule that was based on literature and included follow-up questions to probe each participant’s experiences of their anatomy teaching (see Supplementary material). Interviews were conducted at the University at times and places convenient for the participant. All
interviews were conducted in English (by AH and JH), lasted between 30 - 40 minutes and were in an environment conducive to obtaining good quality data ie a safe and quiet environment with only the interviewer and participant present. Interviews were audio-recorded and transcribed verbatim. Transcripts were quality checked against the recordings for accuracy.

Data was analysed using inductive thematic analysis to identify major themes within the data. Transcripts were read repeatedly to identify codes or nodes that described data items. Codes were interrogated across the data and clustered to develop the major themes through triangulation by three authors (APR, AT and AH), with disagreements resolved through discussion and consensus. Individual themes were considered in the context of all transcripts using a constant comparison approach in order to outline a detailed overview of the phenomenon. Data was analysed using QSR NVivo data management software that supported the development and maintenance of an audit trail during the analysis. Multiple perspectives were considered within the transcripts, including deviant cases, during themes development until agreement was reached between the research team (APR, HN, AT and AH) via discussion and consensus. During thematic analysis, researchers critically reflected on their coding structure, the data and previously held beliefs identified in the epoché, to examine their analysis for bias and ensure codes were apparent in the data. A small selection of participants was asked to review the themes to enhance validity; these participants reported that the themes identified by the authors were an accurate reflection of their experience.

Ethical approval for this study was granted by the programme board of the postgraduate certificate in academic practice at the School of Education, Durham University.

Results
Sixteen students were recruited to the study and their demographics and stage of study are detailed in Table 1 (available as supplementary material via request to the corresponding
author). All students recruited were in the same cohort, had completed the anatomy teaching, and were approaching the end of their first year of study (Stage 1) or had recently started their second year of study (Stage 2) at the time of the interview. Quotes are provided and were chosen for inclusion by consensus to illustrate the themes. Four themes were identified, these were i) assumptions of anatomy, ii) anatomical variation and professional care, iii) how students learned and iii) Future application. Themes are described in detail below with supporting quotes provided in Table 1 – 4. Theme 1 describes assumptions of anatomy that included expectations about and preparations for the anatomy lab (see Table 1). Theme 2 Anatomical variation and professional care describes the ‘what’ was learned as new knowledge and skills concerning anatomical variation and professional attributes were developed (see Table 2). Theme 3 How students learned relates to ‘how’ students experienced anatomy sessions, reporting participants’ cognitive and operational experiences of learning (see Table 3). Finally Theme 4 Future applications describes students’ reported expectations of how learning might fit in to future pharmacy practice (see Table 4). Diagram 1 illustrates a coding hierarchy of what was learned by students, this demonstrates how data was coded, with larger boxes denoting a greater presence of the code within the data. Diagram 2 illustrates the parent and child codes that were used to generate themes regarding ‘how’ students experienced anatomy sessions.

In Theme 1, entitled assumptions of anatomy, participants compared their experiences of anatomy within the MPharm programme to previous learning such as A-levels or Scottish Highers, which a pre-University qualifications in the United Kingdom, as well as voluntary and paid work experiences. Some students based assumptions of cadaveric tissue on previous exposure through television and films. Previous learning of anatomy was described as superficial in comparison to anatomy sessions, with students describing a shift in their understanding of anatomy. Students reported a range of experiences involved in preparing for their first session, extending from practicing open-mindedness and pre-reading materials for the session, to anxiety, trying not to think about the session and engaging in discussion with
medical student peers - as to how best to deal with the smell of formaldehyde. One student
described their expectation of the atmosphere within the anatomy lab as akin to a graveyard
and reported their experience of surprise at the scientific nature of the learning environment.
Theme 2, entitled Anatomical variation and professional care (see Diagram 1 for coding
structure) included data that described students’ learning outcomes. This theme was
characterised by two major experiences. The first focused on learning about anatomical
structures, for example the shape and size of various organs, as well as developing an
understanding of individual patient variation between the same organs or anatomical systems,
such as the heart and liver. Students also described learning how component parts ‘fit
together’ and the proximity between organs within an anatomical landscape. The second
learning outcome that was interpreted related to professional care. Although a variety of
emotions were expressed, including awe, respect and wonder, appreciation and "switching
off" (emotion suppression) were also reported. Students experienced developing respect for
the patient and empathy, reflecting on the privileged position of healthcare professionals, who
have access to intimate parts of patients’ lives, and in the case of working with cadaveric
tissue, deaths. Students described learning to control their emotions and reported experiences
of learning to deal with death that contributed to the development of their professionalism.
One student reported this as their first exposure to a patient in an academic setting, which
appeared to highlight the praxis of pharmaceutical care.

How students learned was clustered into the third theme, were students described cognitive
and operational experiences of learning anatomy as a hook or an anchor, providing visual
cues to focus learning and prompt recall (see Diagram 2 for coding chart). Students described
experiences of haptic learning, ie feeling and touching the specimens, enabled them to
achieve a deeper understanding of anatomical structures that was, at times, juxtaposed with
learning from textbooks and lectures. The majority of students described learning through
practical anatomy sessions more engaging than textbooks or lectures, as they could recall
what they had seen and held. Some students reported surprise at the differences between
textbook diagrams and the reality of human tissue. Students made reference to undertaking supplemental activities to support their learning, which included follow up reading for further detail. Students described difficulty in sessions when cadaveric tissue more closely resembled living patients, for example when specimens were not pro-sectioned, nails were still painted or faces were uncovered. Some students also described difficulty with learning in the dissection lab environment as well as anxiety relating to exposure of cadaveric tissue, which once overcome, enabled them to control their emotions more readily.

The fourth theme included students reports of the future application of their experiences that highlighted the value of a good understanding of anatomy for their future practice as pharmacists. The majority of students identified hospital or clinical pharmacy as being the role most likely to benefit from their experiences in the anatomy lab, however some students were also able to reflect on the application of their knowledge to retail pharmacy and industrial roles. Students described overcoming difficulties in the dissection lab as informing their ability to deal with difficult situations that might arise in their future practice. Students outlined that difficult experiences of dealing with death in anatomy had made them feel more prepared to control their emotions when faced with subsequent difficulties when practicing as pharmacist.

**Discussion**

Students characterised their experiences of ‘what’ was learned and ‘how’ it was learned within two paradigms, the first described developing an understanding of variation of anatomical structures between patients, while the second described developing attributes such as empathy, respect, and how to manage emotions in professional settings. Students described experiences of haptic learning, where hands on experiences, sights and smells acted as a hook to anchor additional learning from textbooks and lectures. Finally, students articulated the value of their learning for their future careers, particularly with regard to dealing with difficult situations in clinical practice and developing practices of patient-centred
pharmaceutical care. Our study highlights a need for students to be prepared for high levels of
cognitive load.\textsuperscript{11} This could be supported through reflection, such that students know
themselves better, are aware of their thoughts and can predict reactions to experiences that
may be unsettling and potentially negative. Integrating reflective practice with knowledge and
skill development may also prevent “ironic rebound” and so the full extent of learning may be
realized more readily.\textsuperscript{12}

The current literature describing anatomy teaching within pharmacy programmes in the
United Kingdom is scarce. Much of our existing understanding of pharmacy students’
experiences of learning anatomy stems from work conducted in the United States, for
example a study by Limpach and colleagues who compared student performance and
perception of human anatomy teaching between a distance learning cohort and a campus-
based cohort.\textsuperscript{13} This work suggests that distance learning programmes can be successfully
employed in pharmacy education as a way to teach human anatomy. However in contrast to
our approach in this study, the work by Limpach and colleagues used a statistical approach,
quantifying success as the primary endpoint as differences in grade point averages. Whilst
these findings are a meaningful and useful method for evaluation of learning, they fail to
explore the complex learning processes of ‘hands on’ anatomy teaching that may be better
understood through qualitative methodologies. Future research could be conducted with
pharmacy students on distance learning programmes to identify differences in the structural
and textural components of the learning experience. Further research might also explore the
stage at which anatomy teaching is delivered, for example in fourth year where professional
practices may be more established than first year, and the impact this may have on learning
professional attributes.

Anatomy has been identified as a pre-requisite for many pharmacy programmes in the United
States, with existing literature identifying considerable variation in pre-requisite anatomy
teaching.\textsuperscript{4} The inclusion of anatomy in medical undergraduate curricula and practice is well
documented although anatomy teaching in medicine in the UK has declined in recent years.\textsuperscript{14} Whilst cadaveric dissection remains the most favoured method of anatomy teaching, only 12 out of 32 registered medical schools now offer it as their main method of teaching anatomy, rather favouring technology-based teaching methods.\textsuperscript{14} This may reflect broader approaches to medical education that disassociate the patient’s identity from their body, a phenomenon described as the ‘medical gaze’, whereby bodies are increasingly measured, quantified and abstracted from patients’ identities and everyday lives.\textsuperscript{15} Removing the physical component of anatomy education arguably separates students from the reality of a patient and a patient’s death. The ‘pharmacy gaze’ describes pharmacists’ perceptions of patients’ bodies whereby the body is conceptualised as an abstracted, diagrammatic entity on which medicines have an effect, as opposed to a conceptualisation of the body as part of the patient as a whole.\textsuperscript{6} Our findings draw on these concepts to argue that through exposure to cadaveric specimens, pharmacy students might more readily develop respect and empathy for users of pharmaceuticals, rather than a superficial abstracted understanding of the body and it’s relation to medicines. Further work should consider the long-term impact of students engaging in practical anatomy sessions and the influence this has on learning physical examination techniques and consultation skills as well as future practice.

Using human remains in education helps introduce students to death in a controlled way alongside further materials on the process of death.\textsuperscript{16} Teaching human anatomy in this way may help start a journey of professional care that does not result in detachment, desensitisation and disconnection, but rather encourages patient-centred professionalism, required for the future as practicing pharmacists. In this way a unique point is established whereby students may experience a dramatic change from their pre-university studies to their new applied career pathway as a healthcare professional. For this internal change to take place students must recognize the experience to be described by Festinger as dissonant,\textsuperscript{17} Mezirow as disorientating\textsuperscript{18} or by Meyer and Land as ‘troublesome’.\textsuperscript{19} This place of transition, referred to as ‘liminal space’, can be deeply emotive sometimes taking the form of
pain, fear, anxiety or even exhilaration.\textsuperscript{20, 21} Fear of the situation may invoke a state of ‘numbness’ where the learner may feel like they are suspended in time or under anesthesia and presentation of cadavers may bring on a defensiveness in which the student shield themselves from unease through disassociation from the experience.\textsuperscript{22} An acceptance and reorganization of the sensory information can then occur at a later time in a safer environment inducting students into a community of professional practice. Our study sheds light on this phenomenon, suggests the experience of strong emotion and "dissonance" may be part of the ritual process of professional socialization.

A limitation of a qualitative approach is that the findings of the study may not be generalisable and can only reflect the experiences of those that took part in the research.\textsuperscript{9} However the experience of the pharmacy students that took part in this research may be transferable to experiences of pharmacy students in similar contexts, for example those in other areas of the United Kingdom or other countries with similar pre-professional training models. The methodology employed allowed students to provide ‘thick descriptions’ of context, experiences and perceptions, which improves the transferability of the findings.\textsuperscript{23} In qualitative research it is important to reflect on the role of members of the research team.\textsuperscript{8} A drawback of this study is that the interviewers were well-known senior members of staff within the School of Pharmacy and one was directly involved in teaching much of the anatomy content, which may have limited participants’ responses. Future work should seek to use an independent interviewer to reduce the risk of bias. Despite these limitations the study used a robust theoretical framework and recognised methods of data collection and analysis that improves the dependability of the results. The audit trail improves transparency and analyst triangulation improves credibility.

In conclusion, this qualitative study demonstrates that teaching anatomy to undergraduate students goes beyond developing a broad knowledge of anatomical structures but also engages a deeper conceptual appreciation of professionalism and engages the student within a
professional community of practice. This work raises questions as to how anatomy teaching
may be positioned within a programme of study to help students to learn clinical skills, such
as physical examination and consultation, and if this can be completed alongside medical
student cohorts. Additional questions may be raised concerning how anatomy teaching
provides a platform for other disciplinary learning, such as drug delivery.

Acknowledgement
The authors would like to thank the students for taking part in the research, members of staff
that contributed to anatomy teaching for the MPharm from Durham University and Newcastle
University and those that have donated their bodies to scientific health research, education
and training.

Conflict of interest statement
The authors declare no conflicts of interest.

Funding statement
The authors declare no funding was received to complete this study.

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