

# A qualitative study of how students learn from human cadavers

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## SUMMARY

Anatomy is a key area of knowledge relevant to many disciplines and cadaveric dissection is a popular and effective option for anatomy teaching for many disciplines. Much of the previous research into how students learn from cadaveric dissection involves students of medicine. This paper revisits key findings reporting research involving medical students outlining the complexity of the issues raised in learning anatomy through cadaveric dissection. We also present the findings from a small-scale qualitative study, which aimed to explore students from a range of disciplines about their experiences of learning anatomy from human cadavers, conducted over a 12 month period at the University of Sheffield, UK. This included eight first-year medical students, one first-year dentistry student, two students from a post graduate course in the Department of Archaeology, and two second-year biomedical science (BMS) students. The study provides important information about students, including those outside medicine, and their experiences of learning anatomy from cadaveric dissection. Students could observe anatomical variation and learn through the multisensory experience of dissection. Overall, cadaveric dissection was viewed positively although there was one exception. The most important findings are that there was no suggestion that students objectified the

body, and this is in contrast to previous work in the area. In fact, students disliked the aspect of prosections that meant that they were disconnected from their human bodies. The second important finding is the similarities of perceptions across disciplines, and this is a departure from previous research, which focuses on medical students. We make some tentative suggestions for the preparation and support for students learning anatomy from cadaveric dissection.

**Key words:** Anatomy teaching – Student's experiences – Cadaveric dissection – Qualitative methods – Objectification of cadaver

## INTRODUCTION

Anatomy is a key area of knowledge relevant to many disciplines including medicine, dentistry and other health sciences (Bergman et al., 2013). However, though much less well documented, human dissection is a well-established way by which human anatomy is learned in other disciplines, including archaeology and physical anthropology. For example, the knowledge of osteology and morphology used by such professionals has been hugely important in advancing understanding of evolution (Mays, 2010).

Traditionally, in the teaching of anatomy dissection was the predominant teaching tool (Gosh, 2017). However, more recently a variety of other methods has been introduced including prosection (Winkelmann, 2007), plastinated and unplastinated models; physical and virtual resources; and vari-

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*Submitted:* 4 April, 2019. *Accepted:* 31 July, 2019.

ous types of imaging (see, for example, the UK University of Plymouth virtual dissection table <https://www.plymouth.ac.uk/news/virtual-dissection-table-a-first-for-plymouth-medical-and-dental-school-schools>). There have been previous reports about the effectiveness of these different approaches to learning anatomy (Older 2004), but in this paper we present a small-scale qualitative study exploring students' experiences of learning anatomy from human cadavers, conducted over a 12 month period at the University of Sheffield in the UK and place our findings within the context of previous research. Where this study differs from others is that it includes a more diverse range of students' views on the use of cadaveric dissection as a learning tool, including students from archaeology, dentistry and biomedical science as well as medicine.

Much of the research on anatomical dissection is based on medical students. Research involving medical students suggests that cadaveric dissection is a popular and effective option for anatomy teaching (Older, 2004; Anderton et al., 2016). It is considered by students to be a unique learning experience, one in which students feel privileged and are grateful to those who donate their bodies (Flack and Nicholson, 2018). A questionnaire study of medical students at 19 British medical schools about their perception of anatomy teaching found gross dissection to be the most favoured method (Ali et al., (2015). Similarly, in research from a London medical school, students stated that dissection was 'essential for learning anatomy' (Lempp, 2005). A study at the University of Bristol provided similar results where students thought that 'seeing dissected specimens is essential to understanding anatomy' (Davis et al., 2014).

Further, positive opinions about dissection as a learning method were found in the USA (Hussein et al., 2015). This survey data revealed that these first-year medical students thought dissection was important to gain 'familiarity with the human body' and 'enhance their practical skills' (page 168). Additional studies have discovered positive views of cadaveric dissection, whilst also recognising some limitations. For example, nearly 50% in an Australian study found it difficult to identify structures and found it to be 'time consuming' (Dissabandara, 2015).

Significantly, however, existing studies into cadaveric dissection have generally found that it provides contextual sensory impressions with students reporting that dissection combined a visual and tactile approach that led to their effective learning (Gosh, 2017). Dissection allows a tactile application and practical skills approach to learning (Lempp, 2005); 'enhanced integration of knowledge' (Ali et al., 2015); permitting students to 'combine theory and practice' (Lempp, 2005) and providing 'sensory familiarisation' (Granger, 2004; Lempp, 2005), which helped them understand the

structures and organs of the body. Students found it beneficial to 'see and feel the structures' in cadaveric dissection (Smith et al., 2014), whilst also allowing them to be exposed to 'anatomical variability' (Granger, 2004) as each body is unique and may also have pathologies. However, others said they preferred supplementing their learning with different means (i.e. 3D imaging techniques, online resources or textbooks) (Gosh, 2017) in order to consolidate their knowledge.

Whilst cadaveric dissection has been reported as a positive learning experience, it is also identified as an emotional one (Arráez-Aybar et al., 2008; Hancock, 2004), where students may feel emotional stress through finding the process 'uneasy' (Hancock, 2004) and 'anxiety-provoking' (Hussein et al., 2015). These feelings are seen to diminish as students progressed with dissection. Some students reported developing strategies to become 'desensitised' and 'numb' (Hancock, 2004) to the situation by 'pretending it's not actually a person' (Hancock, 2004 page 23) through 'rationalisation' and 'objectification' of the cadaver (Sándor et al., 2015). Some research has suggested that dissection contributes to a lack of empathy and emotional detachment in medical students, which is carried with them into clinical practice (Bockers et al., 2010). However, this is not supported by more recent research in which students did not forget that the cadaver was once a person (Flack and Nicholson, 2018). Despite instances of emotional shock on initial exposure to cadavers (Gosh, 2017), which includes not only visual and tactile but also strong olfactory stimulation, Gosh argues that this is an essential part of student's emotional adaption. That said, a very small number of students in Flack and Nicholson's (2018) research reported not enjoying dissection and being too affected to partake (page 328).

It is perhaps unsurprising that students would describe cadaveric dissection as stressful. However, and importantly, cadavers have been described as a medical student's 'first patient' (Gosh, 2017), and with that comes the requirement of responsibility, respect, empathy and teamwork (Boeckers and Boeckers, 2016). Therefore, cadaveric dissection is not all about teaching anatomy and many studies (Granger, 2004; Gosh, 2017; Hussein et al., 2015; Flack and Nicholson, 2018) highlight its importance beyond this in terms of professional insights and behaviour, especially for medical students. It can encourage students to reflect on ageing, end of life care, death and dying (Boeckers and Boeckers, 2016) and promote appreciation of the human body and the distinction between normal biological variation and pathology (Hussein et al., 2015). However, little is known about how students learn from cadaveric dissection in other disciplines outside medicine.

With these reported findings in mind, we now

move to present the findings from our interview study which involves students from other disciplines as well as medical students. The findings are presented in broad generic themes and use data from the interviews with students for illustration. A significant aspect of using cadaveric dissection as the principle method to teach students Anatomy in the UK is the cost (in financial terms) and the availability of suitable specimens. Although both these are important considerations, they were not the reason for conducting the present study, so neither of these are addressed directly in this paper. Of course, both are recognised as important potential constraints on the use of this approach in modern universities.

## MATERIALS AND METHODS

Much of the research conducted into student's experiences of learning from cadaveric dissection is based upon survey data, although qualitative research has been used in some studies into student's perceptions of anatomy teaching published in the anatomical literature (see, for example Bergman et al., 2013; Lempp, 2005). Whilst qualitative research has a long and illustrious career in the social sciences, it is still often misunderstood in other disciplines that have been dependent upon measurement and analysis of causal relationships between variables. By contrast, and in the phenomenological tradition, we wanted to explore the socially constructed nature of experiences and how students gave meaning to their teaching and learning environment (Denzin and Lincoln, 2000). To put the sample size into context, samples in qualitative research tend to be small in order to support the case-oriented analysis that is the purpose of this methodological approach. It is also important to note that qualitative samples are purposive, and therefore participants are selected by virtue of their capacity to provide richly-textured information. This is in contrast to probability sampling employed in quantitative research. The determination of qualitative sample size is also determined by theoretical concerns, and the number of interviews are conducted to the point where no new themes are forthcoming. Whilst this does depend, to a degree, on the phenomenon being studied, it has been recommended that qualitative studies require a minimum sample size of at least twelve to reach data saturation (Guest et al., 2006; Clarke and Braun, 2013; Fugard and Potts, 2015). Therefore, a sample of thirteen was deemed sufficient for this study.

The interviews were part of an unfunded project at the University of Sheffield in the UK against a background where the teaching of full body dissection is in decline across the sector. Volunteers for the study were recruited through a request on the various online student forums for students, from different departments, who were interested in talk-

ing to us about their experiences of learning from cadavers. We interviewed all the students who came forward. This included eight first year medical students, one first-year dentistry student, two students from a post-graduate course in the Department of Archaeology, and two second-year biomedical science (BMS) students.

Institutional research ethics and governance approval was obtained for this before data collection commenced (in compliance with the Declaration of Helsinki, 2000). All participants were interviewed after obtaining informed consent. The interviews were conducted in a private room in the Medical Teaching Unit (MTU), with experienced staff on hand for support should a student become upset. The interviews were broad, exploring various aspects of student's learning from cadavers and asked questions about student's previous experiences of death, if any, and what they felt they learned from cadaveric dissection. Students were asked to compare other methods of learning anatomy which they have access to, including lectures, text and online resources and prosection. The interviews were audio-recorded and transcribed. A thematic analysis was conducted identifying the main themes (Silverman, 1993). Below, we present these, as they pertain to how students learn from cadaveric dissection.

## RESULTS

An initial question was whether students were aware that the teaching of anatomy at the University of Sheffield involved full body dissection. For all students, except one, this had been a key reason for their decision on where to study, however the importance of this varied between interviewees. One BMS student put it that the prospect was 'a very big deal for me'. For the medical students this was linked more explicitly to career outcomes, whilst stating: (medical student 7) 'it's like a rite of passage for medical students and that was something that was really important to me'. One BMS student was not aware he would do cadaveric dissection. He explained: 'I knew it was like a thing [cadaveric dissection], but I didn't realise that we'd have the opportunity to do it'. This student had particularly negative experiences with cadaveric dissection, to which we return later.

As stated, we were particularly interested in what the experience of learning from cadavers gave to students. Clearly, we had a self-selecting group who wanted to talk to us but, as we will discuss, this was not because they presented a uniformly positive view of their experience. That said, full body dissection provided all the students with important bodily context.

### *Learning in context*

All students had access to prosections and plastinated models, plus supplementary lectures and

text books. What all our students identified as important about full body dissection was how (Archaeology student 1) described as 'you're getting a whole picture'. This student goes on to explain the importance of 'actually being able to dissect it yourself, you're uncovering it basically and having to clean it up yourself and understand where things are in this individual because they vary between person'.

Related to this practical anatomy was thought more complex than anything conveyed in a text book. As one medical student (5) stated: 'we're used to seeing a nice neat diagram which has got like colour coded things whereas the body's not colour coded'.

Additionally, all students described that from one body to another, there was considerable diversity in the presentation of anatomy. All bodies are different. This medical student (14) stated:

'I mean I've seen my cadaver and in my head at the time that's always like this is how it should be. And then you go and see the table next to you and their cadaver may have had like a blood cancer and therefore their heart is massively enlarged and that means that their lungs are pushed off to one side and their thorax is so much like small, squashed and everything ... So it's made me realise that it is very, very diverse erm, and dynamic'.

She went on to describe: 'Just the placement of the organs and the size of organs and the layers of fat, muscle tissue, I think that ... when you look at diagrams you can just sort of try and imagine what it looks like, but then, when you see the actual placement and then you learn that it's not the same in everyone'.

The size of organs was also a significant learning point for another medical student (18) who said: 'you get a shock with little things like when we saw the uterus we were like, that's tiny, that's just tucked away. Or the spinal cord as well, that was tiny. It's weird to think that your spinal cord is so important, but it was so small'.

### **Experiential learning**

All these students described how the multi-sensory process of dissection was important for their learning; what this archaeology student described as 'a hands-on learning experience' (1). Clearly, the visual aspect of dissection helped in memorising: 'it has really reinforced like images in my head now of systems' (medical student 14). This was important for all the students, but as this medical student stated: 'as a Dyslexic I struggle to learn from just books and pictures. Like I want to be able to see it, I want to be able to touch it' (medical student 8).

Working with cadavers took some students longer to get used to than others and the process of adjustment was also very important for students. This archaeology student felt that even after some trepidation at the start, the process of dissection

helped her learn detail: 'At the beginning I wasn't really sure how much I would learn ... but after I'd done it I sort of realised I couldn't have sort of taken in that level of detail without actually, sort of, undertaking dissection' (2).

There was one notable exception to the positive experiences presented above who found the whole experience difficult. This BMS student described the process as 'an overwhelming shock', which he 'hated'. Whereas, for the students above, their learning was reinforced through seeing and touching the body, for this young man, the opposite seemed to be the case. He stated: 'I can't get my head around the fact of like wanting to touch a dead body'. Whilst he did get involved in dissection, he described how 'sometimes it does just feel like you're poking, like squishing and like cutting without knowing what you're doing and in my head that doesn't sit right with being very respectful'. He did explain some positive aspects to his dissection experience, including how different it was and that: 'I can see it in the text book but it's not the same'.

Students found cadaveric dissection overwhelmingly beneficial for seeing anatomy in context. Prosection, however, was described as useful to observe the body in detail, but this did not remove the overall benefit of seeing everything in context. So prosection was described by one medical student as 'more effective' but 'dissection ... gives me the bigger picture ... I still would not be able to put together in my head and imagine the human body until I've actually seen that in full body dissections' (14).

A further benefit of the prosections was that 'it kind of correlates better to what you've seen in the diagram or in a book so I find that easier to learn from' (medical student 18). Therefore, students felt that neither form of learning was better than the other, but that a combination of both was beneficial for deep learning. All students recognised these combined benefits. However, the prosections presented what one medical student described as the potential for 'that element of desensitisation' (7). This is because 'it's only been prepared for you, so you didn't have that experience [of it in context], but it's a limb, it's a heart'. In fact, these students all described processes of coping with dissection, whilst also wanting to actively maintain a connection with the idea of their human cadaver. As this medical student described it: 'the full bodies makes it seem more real and more human' (medical student 18). This also connects to the following theme, which is how students described learning from cadavers through what we loosely refer to as emotional learning.

### **An 'emotional' learning experience**

All students related to the fact that they were learning from a corpse, with some finding this easier than others to adjust to. Most of the students who took part in the interviews, with three excep-

tions, had no experience of death or bereavement. However, whilst students recognised a period of adjustment, the fact they were learning from a cadaver accentuated their learning process because of the heightened knowledge that this was a human body. Most students acknowledged the uniqueness of cadaveric dissection, and as Archaeology student 2 stated 'I feel quite privileged that I had the opportunity [to do dissection]'. As this medical student described:

'it's not a thing about oh you can only learn anatomy through full body. ... I think for me it was the idea that it's a kind of, it's an experience of actually understanding that this is an individual who gave up their body to a medical school so that students could work on them' (7).

So, there was an aspect of learning from cadaveric dissection which was important in its own right. But also, for these students, the fact that this was also difficult created an important learning strategy, especially for future medics, because they were learning a practical coping skill: 'every time you expose yourself to something which could potentially stir up your emotions ... you kind of build-up that strength a little bit' (medical student 18).

## DISCUSSION

We make no claims about the generalisability of these findings as this is not the purpose of this interview study. That said, there are parallels with many of the findings from previous research (Hussein et al., 2018), which is that cadaveric dissection offers students of anatomy a unique and valuable learning experience. A range of students participated in this study, and this is important as it suggests that cadaveric dissection provides a valuable learning resource for all students of anatomy, and not just for those who will go on to work in a clinical setting. As previous studies indicated, and the students in this study have highlighted, dissection provides familiarity with the body and context and understanding of structures. It is a full sensory experience, which helps all students, including the student with Dyslexia, who described how the multi-sensory approach intrinsic to dissection helped him learn. The range of senses involved in cadaveric dissection seems to accommodate most students' personal learning styles. Anatomical variability (normal biological variation or inter-individual variation) was mentioned by both previous research and our students, as was the fact that 'real' anatomy does not look like it does in the books and was not 'colour coded'. Cadaveric dissection therefore, provides a stimulating learning environment for the learning of anatomy across the different disciplines represented here.

Students found the use of prosection and full body dissection a particularly useful way of learning to get the complimentary detail alongside the

full context. This is in contrast to previous research that suggests some students favour prosections over dissection (Hlavac et al., 2017). However, as we have discussed, there is more to learning from cadavers than just the Anatomy. The process of learning was also significant as part of the emotional and professional development in students and again, this appears as a cross discipline component of cadaveric dissection.

The emotional learning is perhaps where we see the departure from previous findings. These findings suggest that processes of so called 'objectification' are more nuanced than has previously been suggested and the students in this study did not describe a process of desensitisation to the cadaver. The comments in relation to prosection suggest that students dislike that the prosection is an object out of context of its human body. This alludes to a more nuanced process of coping for students where the cadaver is 'more human and more real'. These students want to remember that the cadaver was once a living person and this seems to be an important part of the learning experience and not one which is replaced by simple numbness or objectification.

We need to finally acknowledge the student who found the whole process of dissection an 'overwhelming shock'. Undoubtedly, dissection presents some significant emotional challenges (Hancock et al., 2004). These emotional difficulties are part of a threshold experience that, in time, is usually overcome and indeed were overcome even for this student. However, we are reminded that cadaveric dissection may not be the best way of learning for some students. These findings reinforce the importance of skilled anatomy teachers who can recognise that for some students the initial few weeks of cadaveric dissection can be traumatic, and there is a need to recognise this and provide preparation for what to expect, but also ongoing support to students. We also endorse Hussein et al. (2018), who recommend that introductory ethics and continued support be established alongside dissection or allowing students to opt out of dissection in favour of learning from prosections and text books (Flack and Nicholson, 2018). However, we challenge Hussein's notion of providing 'desensitization programs' (2018 page 169). We argue that, based upon our findings, what students value is rooted in the uniqueness of cadaveric dissection and the fact that it is innately about being human, and that in learning anatomy they do not want to forget that. The uniqueness of this experience, and the extra emotional learning which accompanies cadaveric dissection, can also be viewed as important for students of anatomy.

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