
For stimulating multidisciplinary first year students to learn Anatomy for life via innovative, pro-active approaches to improve engagement and learning outcomes

1. OVERVIEW OF PARTICULAR CONTRIBUTION AND CONTEXT

The Discipline of Anatomy & Pathology at James Cook University (JCU) teaches Anatomy to health science students in their first year, with teaching consisting of lectures plus practical classes in the anatomy laboratory. As a traditionally trained human Anatomist, I have great passion for teaching Anatomy. I strive to provide a nurturing and stimulating environment for students that will make learning both enjoyable and stimulating. I am a very enthusiastic teacher and I hope that my efforts will produce enthusiastic student learners. I am on an important path to change the historical views regarding the teaching and learning of Anatomy. By making Anatomy engaging, stimulating and fun, and by helping students to be pro-active learners I believe I am laying the foundations for a new approach to learning Anatomy.

Teaching Anatomy faces inherent and contextual challenges. First, Anatomy is a difficult subject as students have to learn many new concepts and complex terminologies. As a result, students traditionally find this a dull and labour-intensive subject, concentrating their efforts on “memorizing” lists of names in typical surface-learning approaches (Biggs, 2003). Second, there are also more recent pressures as the changing face of medical education in Australia has led to most Australian Universities now having fewer contact hours to teach Anatomy (Creswell, 2010). Third, classes are large and extremely diverse with respect to students’ entry level, prior experience, scientific literacy levels, cultural backgrounds and professional fields. So, over the past 5 years, as a passionate and enthusiastic Anatomy lecturer, I have tried to find and evaluate methods to teach *all* students Anatomy more effectively, in less time, and often with limited resources.

Fundamental to my approach, are several key principles. First, the use of human cadaveric tissues is central to students’ learning experience of Anatomy. The invaluable prosections are, and will always be the primary focus of our practical classes. Accordingly, a major overhaul of the JCU Human Body Donor Program, means that we now have world-class facilities at James Cook University that cater not only for undergraduate students, but also to the ongoing professional training and development of rural GPs, surgical trainees, chiropractors and physiotherapists. Second, my teaching philosophy and approaches are based on “engagement theory”; I believe that students need to be engaged in meaningful learning activities through interaction with others and worthwhile tasks (Kearsley & Schneiderman, 1997; Kuh, 2009). Consistent with Kift (2009), I believe that students need to be engaged, supported and ‘fit in’ in their first year of university, in fact from day one. Further, my teaching style is also consistent with the view that interested and passionate teachers are critical to student engagement (Kift, 2004). My teaching philosophy is one of inclusion of all students. I appreciate that students come from diverse backgrounds, have different abilities and challenges.

My role as an Anatomy teacher is *not* to teach students anatomical facts, but rather to teach them the learning skills that will serve them throughout their student and professional lives. I aim to take students from the traditional view of Anatomy as a subject that requires surface learning (rote learning, memorisation) to one that can lead to deep learning through understanding and the ability to place information into a broad, big picture which also makes it relevant to the students’ realities.

Accordingly, I have introduced a range of innovative, pro-active approaches that complement the use of prosected tissues. My techniques are based on a simple, “hands-on” approach, classes are *not* didactic, and I aim to achieve maximum student engagement. As a result of these approaches, my health science students have significantly increased their engagement in the Anatomy course, improved their cognitive learning skills, become more self-directed in their learning, and have a high level of (long-term) Anatomy knowledge. Therefore, while my principal goal has been to support and assist my first year students develop their knowledge and learning skills in Anatomy, I believe my innovative strategies have also produced life-long, self-directed learners.

This application will present evidence that showcases my impact on Anatomy teaching and the James Cook University Human Body Donor Program over the last 5 years. In addition, I will also present data that shows my Year 1 students have a high level of engagement in the course (via a 2010 survey that compares my students to Medicine students who undertake a similar Anatomy course that has a far more didactic approach). Also, there is evidence that my students are confident in being able to remember my Anatomy curriculum and can summarize and synthesize concepts and facts to make them easier to learn – not only for Anatomy, but also for other subjects.

2. STATEMENT ADDRESSING THE CRITERION

CRITERION 1: Approaches to the support of learning and teaching that influence, motivate and inspire students to learn

In keeping with my reconstructed approach to teaching Anatomy, the laboratory becomes the key focus for action, where team activities encourage 'hands-on', multi-sensory learning by all students. However, the availability of prosections was very low when I arrived at JCU in 2008 (5 cadavers between 2003-7). Therefore, to support the learning of Anatomy and influence, motivate and inspire students to learn, I led a major overhaul of the Body Donor Program, that has resulted in 62 cadavers by April, 2010, translating to an extra 600 prosections for students. To ensure consistency and a team approach, I have also built up a team of well-trained tutors who have a significant impact in fostering small group teamwork in the laboratory environment, further encouraging students to develop self-directed learning skills. Tutors are trained to encourage maximum student engagement using the prosections and my innovative teaching approaches. Tutor numbers have grown from 2 (2007) to over 60 (2011), with higher retention rates as tutors appear to be engaged themselves, happier and motivated to improve their own Anatomy learning. Human cadaveric tissues and a team of well-trained tutors have become central to the learning experience of our Anatomy students and ensure that we achieve the priority health concerns of the communities that our students have a mandate to serve, consistent with the social accountability mandate of the school of Medicine and the University.

The specific approaches that I have developed are "whiteboarding" and drawing, use of play-doh, movement/singing/dancing, surface anatomy, and body painting which all encourage multi-sensory, 'hands-on' learning. I actively take part in modelling these approaches with students, encouraging their creativity and enthusiasm. The lab is arranged so that students work in groups around a dissection table, with a whiteboard at one end and they are required to work together using these approaches to demonstrate that they have a deeper understanding of the structures and relationships before or while they study the prosections.

1. 'Whiteboarding' & drawing – most appealing to visual learners; a valuable learning tool that allows students to summarise and synthesize concepts and facts to make them easier to learn. These visual cues assist with long-term retention of information (deep learning). Similarly, visual learners and artists benefit from drawing anatomical structures on paper or similar and this is encouraged.

2. Use of Play-doh – most appealing to tactile learners, students build anatomical structures using play doh. This approach is enjoyable and reinforces learning, while developing a real 3-D image of structures and their relationships. Visual and tactile learners also benefit from handling bones, skeletons, and plastic models.

3. Movement/singing/dancing – many students learn by 'doing'. In my practical sessions, performing body movements with weights, a hula hoop etc. are encouraged as well as singing and dancing (where appropriate), as it involves movement and this 'doing' assists in long term retention of information for many students.

4. Surface Anatomy/body painting – students consolidate what they learn with prosections by looking at the surface anatomy relevant to the area on themselves, each other, or even on family and friends. This is what they will need to do in their professional lives when working with patients/clients. Body painting has become the most popular technique, as it is a very engaging way for students to learn Anatomy. I developed the "Anatomical Man/Woman" projects where student artists and photographers fully body painted student models – this has been published in the Townsville Bulletin six times, and enthused the Prime Minister Julia Gillard to such an extent that she body painted with them during her visit. She found the experience "a very innovative and entertaining demonstration." The Anatomical Man projects both inspired and enthused students immensely as they witnessed how engaging and beautiful anatomical body painting can be. In subsequent classes we had an incredible number of students participating in body painting. Students become very confident and motivated to carry out this learning approach as either models or painters. JCU is now proudly undertaking the best anatomical body painting in Australia (see below, Prof. Paul McMenamin, Monash).

As an extension of these innovative teaching approaches in Anatomy, I also organise the 'Anatomy Cup' - a mini Olympics that is held at the end of each year as a friendly, fun and stimulating inter-health discipline competition that gives students a chance to showcase all these new approaches for learning Anatomy. Student feedback suggested that for many students this was the highlight of their year and that they felt very proud to participate; it also served as focused revision for their upcoming exams. I have also engaged students from different cultures, such that my Muslim students came second in the body painting in the 2009 competition. This is now an important event on the anatomy and University calendar and we have staff, including doctors from Townsville Hospital competing alongside the students to create a fabulous close to the academic year. I hope to make this a National event in the near future.

3. WAYS IN WHICH THE CONTRIBUTION HAS INFLUENCED STUDENT LEARNING, ENGAGEMENT AND/OR THE OVERALL STUDENT EXPERIENCE, BEEN SUSTAINED OVER TIME, AND BEEN RECOGNISED BY FELLOW STAFF, THE INSTITUTION, AND/OR THE BROADER COMMUNITY.

Students' perspective:

Of central importance is student learning of Anatomy. Analyses of student grades over the past six years (2005-2010) indicate that we are achieving a >80% increase in the pass rate since 2005, and that the fail rate has dropped by over 30% (Figure 1). I believe that this improvement is mainly due to my new teaching approaches that enable students to not only engage fully, but also to achieve better results due to undertaking meaningful and worthwhile tasks. This belief is strongly supported by a student survey in 2010 comparing the responses of 176 of my first year health sciences students to 155 first year medicine students (who do a separate, more didactic Anatomy course to mine), with regards to their perceptions of the course. This study found that my health sciences students were significantly more likely, than the medical students, to enjoy the subject, have higher quality learning experiences, have a higher level of interest in the course, believe the teachings to be more relevant to their later years and professional career, and have a higher level of interaction with both their peers and their teachers (Table 1). Backing this, my SFS data shows I have consistently received scores of 4.1-4.6 on the 5-point scale in questions regarding student interest, motivation and learning experience.

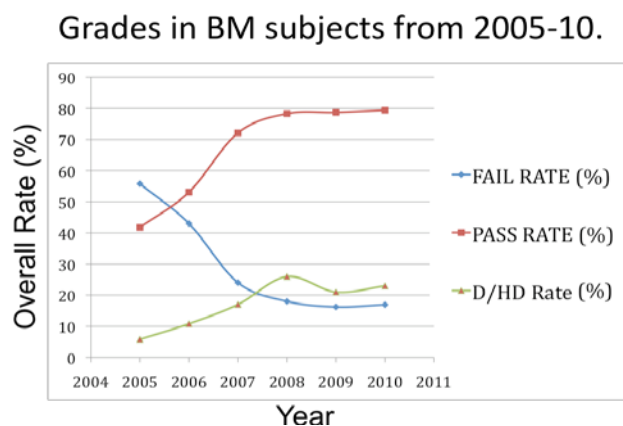


Figure 1: Comparison of pass, fail, distinction and high distinction grades from 2005-10

Table 1: Comparison of self-reported engagement scores between students enrolled in the Health Science Anatomy subject and students enrolled in the Medicine Anatomy subject (scored on 1- 10 scale)

| Engagement variable | Health Science Anatomy subject n = 176 (mean± SD) | Medicine Anatomy subject n=155 (mean± SD) | p-value |
|---------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|----------------------------------------------|---------|
| Your overall enjoyment of the Anatomy subject | 7.9 ±1.4 | 7.0 ±1.4 | <0.001 |
| The overall quality of learning experiences from the activities in the Anatomy subject | 8.0 ±1.3 | 7.1 ±1.4 | <0.001 |
| Your general level of interest in Anatomy teaching activities | 7.8 ±1.4 | 7.3 ±1.5 | 0.002 |
| The relevance/importance of Anatomy learning activities to the later years of your course and to your professional career | 8.6 ±1.6 | 7.7 ±1.4 | <0.001 |
| Your overall level of interaction with peers e.g., discussing ideas | 7.8 ±1.9 | 7.3 ±1.7 | 0.016 |
| Your overall level of interaction with Teachers e.g., feedback, etc | 6.7 ±2.1 | 5.8 ±1.8 | <0.001 |

The 2010 survey found 83% of my health science students thought my practical, innovative approaches assisted their deeper understanding of Anatomy, 81% thought they assisted their long-term memory of Anatomy, and 82% reported that the learning and memory skills they acquired in Anatomy have been useful in other subjects.

This quantitative data is also backed-up by qualitative data from focus groups of health students at the end of 2010. All students were very positive about my teaching. A small sample of comments include:

"Claudia gives everyone an opportunity to learn with her own style"; "Her lectures are always entertaining - she keeps it really pepped up with enthusiasm + energy"; "Everyone turns up for her lectures. People don't turn up for others. Can always hear her, while in others they [students] are talking, etc. She has got our full attention"; "I could not imagine Anatomy without the cadavers"; "Claudia wanted us to be involved in the open day. [An] amazing learning experience. And when you can answer 90% of [peoples] questions, you realize you have learnt stuff"; "Before lectures with Claudia anatomy was a boring, intimidating subject. Now it's my favourite, and I find I have the initiative to learn more - unlike I've ever experienced"; "Anatomical Man was awesome; a great learning experience that encouraged other students and I to get into the body painting and not hold back"; "Claudia uses a variety of techniques to help students become involved in all aspects of anatomy. She is enthusiastic and endeavours to keep every student motivated. Claudia is by far the best lecturer in this area". "Claudia is an inspirational teacher, her enthusiasm and love of anatomy is infectious, and the variety of techniques are fantastic learning aids."

Internal peer review:

My efforts in teaching have been well received and valued by JCU colleagues and I have received consistent positive feedback, and have presented seminars on my teaching strategies by the Teaching & Learning Development Unit. I also have research collaboration with Prof. Ryan Daniel, Head of School of Creative Arts and I will hold an Art Exhibition in 2011 in the School gallery of all our Anatomical Body Painting projects.

"As a clinician interested in anatomy knowledge, I am particularly concerned about the amount of basic anatomy that young doctors know. I have found at Townsville Hospital that junior staff trained in the JCU anatomy department since you have started using your new techniques has improved considerably. I now can rely on juniors to know how many segments in the left lower lobe and where they are, for example. JCU graduates have the heads over other staff trained in other Australian universities in this respect. Carry on the good work!" **A. Prof Tony Lamont, FRCR, FRANZCR, Head of Radiology, Townsville Hospital.**

External peer review:

These teaching techniques form part of the medical education research that I have been undertaking over the past three years. I have presented this work at four National conferences and this year will present at the International Association for Medical Education in Europe conference in Vienna. I have been invited to both India and ANU this year to present specialized workshops on my techniques (approaches).

It is particularly rewarding that colleagues beyond the university also recognize the impact on students' learning of Anatomy of these new teaching approaches. Other Australian and UK Anatomy academics have also commented favourably on these teaching approaches.:

"The students were enthusiastic and clearly enjoying themselves. I commend this as an innovative way of teaching". Dr. T. Welch, MBBS, FRCS (Eng), **Univ. of Cambridge, U.K.**

Re body painting: "It has pleased me greatly that she has taken up this method of teaching, and now would say she have easily superseded my efforts in this area. Her latest results in this area are magnificent, and she has clearly taken this to a new level. My understanding is that her students have strongly evaluated the program and her teaching." Prof McMenamin, **Monash Uni.**

"Clearly your efforts invested in obtaining body donations, and your novel teaching approaches are having a big impact on student engagement with learning at JCU. The anatomy body painting is very instructive for students – particularly those who are right at the beginning of their learning path – and is obviously a lot of fun! I also like the 'white-boarding' concept, since this is an excellent way for students to make material any concepts which otherwise remain abstract. I have no doubt that these methods will improve student performance, and accelerate their rate of learning, and I am keen to adopt them in the Medical Program here at ANU." Prof. J. Provis, **ANU.**

"I was struck by the manner in which you had engaged with the students, and created a learning environment that the students were able to positively identify with at a personal and group level. I feel you must be commended for engaging all members of the teaching and learning team in this manner. My direct feedback from your students was that they felt they were being encouraged to make their own positive contributions to the learning experience, for themselves and their cohort, leading to a high level of commitment and student satisfaction. I believe your strategies for actively "immersing" students in the learning process with innovations such as the anatomical body painting will undoubtedly lead to a deeper engagement with the subject matter with consequent professional gains. Prof. D. Pow, **University of Queensland.**

CONCLUSION

Taking these new perspectives on traditional methods of teaching anatomy provides a much more engaging, motivating, inspiring and enjoyable environment for student learning. Our Anatomy course is now producing students that are achieving the desired learning outcomes, and are confident, self-direct learners. When used in conjunction with wet anatomy classes, these innovative approaches appear to provide motivation that leads to deeper learning. Our students appear to be enjoying their anatomy experience in their first year at University and they are displaying levels of engagement and achievement not seen before in our area. Many students have been so engaged and inspired by their learning experience that they now work as casual staff in Anatomy as tutors and dissectors. Such outcomes encourage me to consider that we are on a very productive path to revolutionize the teaching of Anatomy in ways that meet students' needs and the challenges of the contemporary context.