

Utilizing the scholarship of teaching and learning to design an Anatomy Pedagogy Course

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SUMMARY

Several research articles have reported the shortage of qualified anatomy teachers across different countries. This issue is being addressed by developing graduate anatomy training programs where students are taught the different anatomical sciences. These graduates will also need to be trained as educational scholars in order to face the challenges in their future careers as academics. To address this educational need, in this article we discuss the design and development of a new course in ‘Anatomy Pedagogy’ that we successfully integrated into a new innovative master’s program in human anatomy in our institution. This course was designed by utilizing the different principles of the scholarship of teaching and learning. In this article, the authors aim to outline the content of this course and analyse it in light of the scholarship of teaching and learning. This includes the learning outcomes, faculty-led learning, student-led teaching, teaching practicum and the different assessment techniques used on this course. Some of the principles used to analyse this course includes universal design for learning, teaching for understanding, assessment as learning and peer to peer learning. In the coming academic years, the authors aim to collect qualitative and quantitative data what will help inform the future delivery of this course.

Key words: Anatomy education – Scholarship of

teaching and learning – Curriculum design – Universal design for learning – Teaching for understanding – Assessment as learning – Peer learning – Rubrics

INTRODUCTION

Anatomy as a discipline has traditionally been taught by a mix of clinicians (Medical Doctors) and scientists (Doctors of Philosophy) (Lockwood and Roberts, 2007). A recent study, surveying anatomists teaching in British and Irish universities, concluded that the largest group of teachers are medically qualified (Balta et al., 2017). Meanwhile, in the past years there has been a significant decrease in the amount and manner of anatomy being taught to medical students and other health professions (Drake et al., 2014). This raised the question whether future clinicians will have enough anatomical knowledge to become scholars in the discipline of anatomy. Moreover, there has been a decrease in the number of undergraduate anatomical science courses, which has resulted in a shortage of anatomically qualified science graduates entering into PhD programs (Fraher and Evans, 2009). This may explain why the second largest group of anatomy teachers in the United Kingdom and Ireland have PhDs in a non-anatomical science (Balta et al., 2016).

The advancement in technology has led to the establishment of new research areas within the anatomical sciences. This has required a different approach to training, compared to the traditional anatomy programs, which typically only include gross anatomy, embryology, histology and neuroanatomy (Brokaw and O’Loughlin, 2015). As previ-

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ously alluded to, there are various reasons for shortage of qualified anatomy teachers across several countries (Rizzolo and Drake, 2008). In response to this shortage, several universities across the United Kingdom, United States of America and Ireland have developed masters or PhD programs in anatomy (Brokaw and O'Loughlin, 2015). Some of these programs have been also designed to train the students not only for a career in anatomical teaching but also in medical education research (McCuskey et al., 2005).

Being an academic requires the ability to balance two identities: one being a disciplinary identity, in this case, as a scientist, the other as a teacher (Aydeniz and Hodge, 2011). The scientific identity as a disciplinarian is developed as an integral part of training when gaining an initial qualification in anatomy. However, there is a lack of a formal training of disciplinarians establishing their identity as a teacher. Indeed many faculty are often hired on the basis of the research track record, with teaching often being an afterthought which is summed up by Randy Bass in a comment; leading to a situation described by Randy Bass, where “*we merely have to pray that this young scholar can teach*” (Bass, 1999). However, with the developmental of formal anatomy training programs, some anatomy education students are now required to deliver different types of teaching sessions as part of their graduate training program, while others do not face this requirement (Svyantek et al., 2015). Developing an identity as an educator is essential in being able to optimize student learning, and hence why it is vital that trainees gain exposure to different teaching experiences.

The first taught postgraduate program in human anatomy in our country was developed in 2017 at our institution. This Masters (MSc) in Human Anatomy has been designed to assist in training the future generation of anatomists. One of the courses delivered on this degree program is Anatomy Pedagogy, which resulted from a collaboration between the Centre for the Integration of Research, Teaching and Learning (CIRTL) and the Department of Anatomy and Neuroscience (DAN). On this Anatomy Pedagogy course, students have the opportunity to learn about the principles of Scholarship of Teaching and Learning (SoTL). They will also learn how to embed these principles in teaching, learning and assessment methods, and at a later stage apply this knowledge in different teaching contexts.

The creation of this program has focused on educating anatomy students on how to develop themselves as teachers, and has been underpinned by the principles of the Scholarship of Teaching and Learning (SoTL), which encourages teachers to think about investigating their teaching “problems” where the focus shifts from one of terminal remediation, to a reflective process of on-going investigation (Bass, 1999). These same principles were used to design this course and ensure that that it is deeply rooted in the scholarship of teaching and learning. Some of these principles include: 1) Uni-

versal Design for learning, 2) Teaching for Understanding, 3) Assessment as Learning and peer learning. Each of the principles essentially overlap and combine and embrace new ways of thinking about teaching and learning in order to enhance deep learning and engagement for students as illustrated in Fig. 1.

1) The Universal Design for Learning Framework

Universal Design for Learning (UDL) is an educational framework, the principles of which can be used in planning whole programs, courses, modules or smaller units such as individual classroom- or lab-based sessions (Novak & Thibodeau, 2016). All learning underpinned by a UDL approach is student-centred (Novak & Thibodeau, 2016), and educators ask themselves a series of questions in order to interrogate their curriculum to ensure it is in alignment with the tenets of UDL such as:

Principle 1: Provide multiple means of representation for students.

Guiding Questions: How will students interact or persist in the program/module/course/lesson/session? How am I going to provide ‘multiple means of representation’ for the anatomical topics under study?

Principle 2: Provide multiple means of action and expression for students.

Guiding Questions: How will students deal with the content of program/module/course/lesson/session? How will students engage in actions to demonstrate their understanding of the material? How will I provide opportunity for students to perform their knowledge for the anatomical topics?

Principle 3: Provide multiple means of engagement for students.

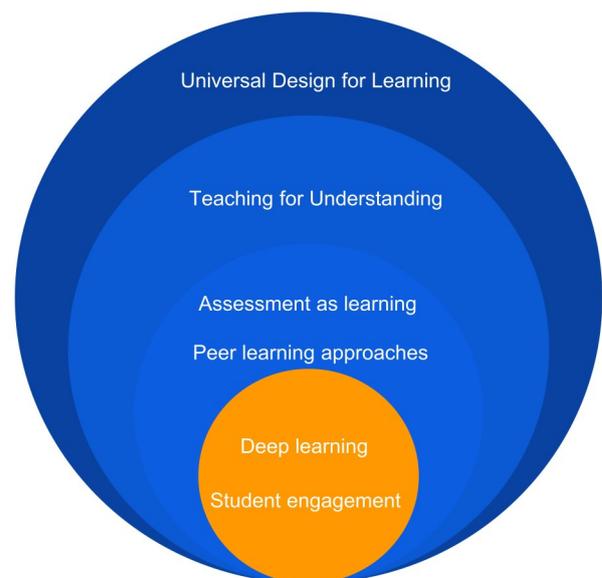


Fig 1. The overlapping and interconnected elements of universal design for learning, teaching for understanding and assessment approaches resulting in deeper learning and student engagement.

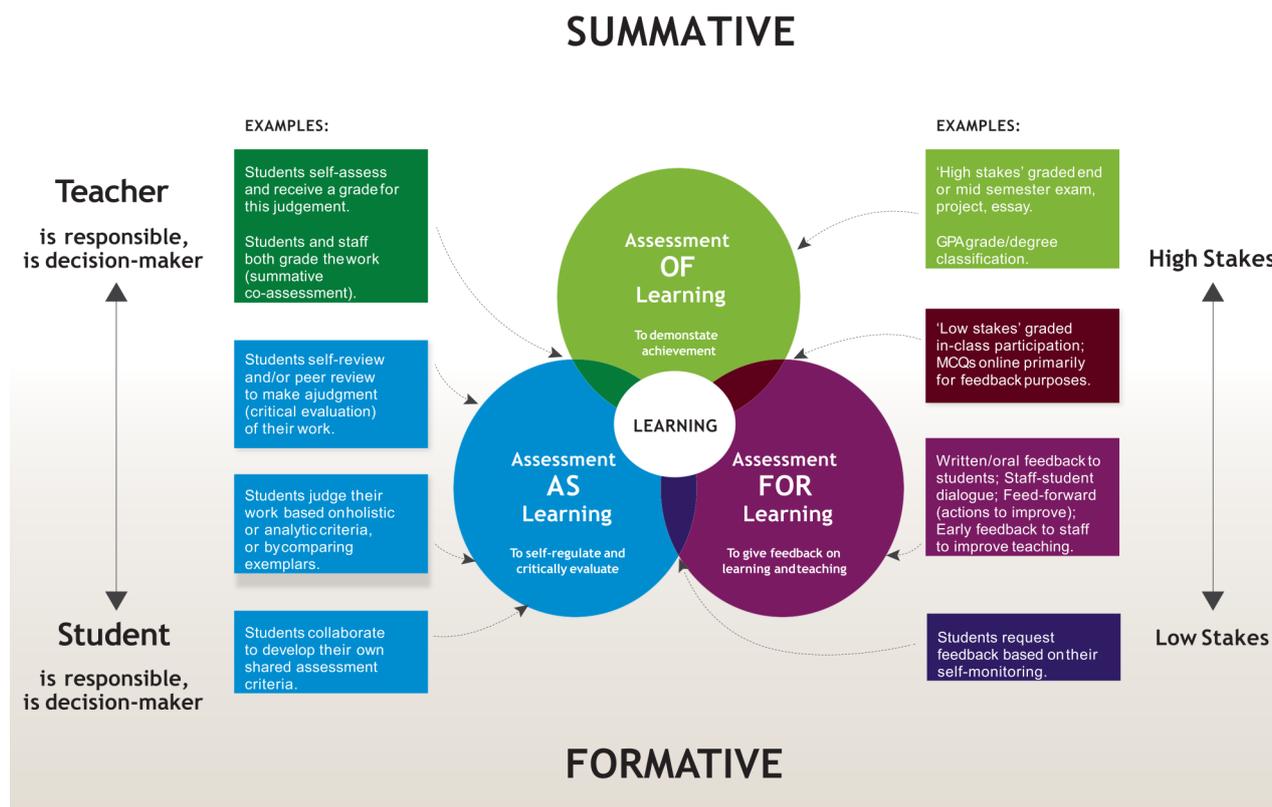


Fig 2. Assessment as/of/for Learning: The National Forum for the Enhancement of Teaching and Learning (NFETLHE, 2017).

Guiding Questions: How will students interact with the content of the program/module/course/lesson/session? How will students interact with each other and the teaching team (Novak and Thibodeau, 2016)?

A UDL framework allows for diversity within the curriculum to accommodate for diversity in student learning, rather than the expectation that students will change their learning approaches based on the constraints of the curriculum (Supple and Abgenyega, 2011). It is built on the concept of a strengths-based or 'growth mind-set' approach to learning, rather than deficit-based which sees students as empowered with the ownership over how they learn (Lang, 2016).

2) Teaching for Understanding Approaches

What is understanding? Perkins (1998) suggests that we must consider this fundamental question in order to fully inform our teaching approaches. According to Perkins, understanding means "to perform flexibly with the topic - to explain, justify, extrapolate, relate and apply in ways that go beyond knowledge and routine skill. Understanding is a matter of being able to think and act flexibly with what you know" (Perkins, 1998).

This is at the heart of the Teaching for Understanding Approach (TFU). How can students show that they understand? Perkins argues that educational approaches have been concerned for far too long with representational views of understanding, 'which claim that there is a definite representation

of understanding which teachers transmit, and which learners do not possess' (McCarthy, 2008). Perkins's argument hinges on a performance view of understanding; this is in contrast to the representational view of understanding, where students perform or demonstrate their knowledge in tangible ways.

3) Assessment as Learning and Peer Learning Approaches

These final principles align well with the two previously presented: How can students show that they understand? Which are the different ways in which students can perform or demonstrate their understanding? How often do we think about these principles and apply them to the context of student assessment?

Rethinking assessment requires a rethinking of our notions of what constitutes knowledge, and we assess student knowledge through application rather than regurgitation of facts (Novak & Thibodeau, 2016). In planning a curriculum it means considering smaller, lower stakes assessment (formative) throughout the year instead of high stakes large assessments at the end of the year (terminal or summative).

Figure 2 explains some of the main points to consider in assessment design when we are looking to design assessment as a fundamental component of learning. An important element in the assessment as learning approach is the incorporation of self and peer assessment – giving ownership of

the learning to the student, and also allowing students to learn from and be part of each other's learning.

In this paper we aim to present this course by discussing the teaching methods, performances of understanding, assessment techniques and rubrics which were used to assist in the student learning process.

DESCRIPTION

Course Introduction

In the Anatomy Pedagogy course, students are taught how to teach anatomy. For this reason, this course is delivered over two semesters where the students first have the opportunity to learn anatomy and Educational theories in the first semester, and then apply these principles to the teaching of anatomy in the second semester. This is achieved by providing students with an opportunity to become familiar with some of the SoTL principles and before they are taught on how to implement this knowledge to their anatomy teaching. Faculty teaching these sessions where students are exposed to the principles of SoTL prompts them to think about the following: 1) How can course content, materials and in-class activities encourage all learners to participate? 2) What does understanding 'look like'? 3) How can assessments be designed as transparent, authentic learning experiences, to encourage higher order thinking, deep learning and active participation?

The course is divided into three elements. The first element is faculty led, the second is student led and the third is their teaching practicum. These three elements will help the students achieve the outlined course learning outcomes listed below, hence by the end of the course they should be able to:

- ◆ Improve their ability to deliver a set of learning outcomes.
- ◆ Provide context as to where specific teaching and learning goals lie in the curriculum.
- ◆ To promote understanding as to how students learn using a 'reflector model'.
- ◆ Demonstrate critical reflection on personal teaching practice within their disciplinary contexts.
- ◆ Engage with various sources of evidence and scholarship to evaluate and improve their teaching practice.
- ◆ Explain the need for adequate preparation and design of learning sessions.
- ◆ Prioritize tasks and manage their time efficiently.
- ◆ Participate actively in team-based tasks and group learning opportunities.
- ◆ Deliver cadaver based tutorial.
- ◆ Design, deliver and evaluate an event or activity to enable student learning.
- ◆ Work in a laboratory setting according to the health and safety measures in place.

Faculty-Led Sessions

In these sessions, students are introduced to the educational scholarship within the discipline of anatomy and to SoTL principles. These sessions are co-taught by staff from the DAN and CIRTL. Sessions delivered by faculty from CIRTL are taught to students registered on different programs, one of which are students completing the MSc in Human Anatomy. These sessions are very interactive, and the faculty primarily plays the role of the facilitator. Some of the topics covered in these sessions covers students' learning as grounded in UDL and TFU approaches, and how space (classroom, lab, lecture theatre, etc.) can either impede or enhance teaching and student learning. Students also use a decoding of the discipline framework (Pace, 2017) to identify, critique and understand the disciplinary practices and signature pedagogies traditionally housed within the discipline, such as lab-based work or large lectures. Students also learn about entry points to learning, and how various entry points can be used as a way of engaging their own students in materials, methods, content and ideas in different ways – this might be through visuals, auditory stimulus, tactile objects or even works of art, such as the approaches used in ("Project Zero," 2016).

Student-Led Sessions

The second element of this course is student-led. These sessions are 1-hour long, with 45 minutes of delivery followed by a 15-minute discussion led by the student teacher. Every student is required to choose an anatomy teaching method from a non-exclusive list that covers: small group teaching; problem-based teaching; case-based teaching; art-based teaching; prosection vs dissection; soft vs hard preserved cadavers; digital technology; radiologic anatomy; assessment. Students are encouraged to deliver a highly interactive session, which they design under the supervision of the course coordinator.

Teaching Practicum

In this element, students get hands on experience, and they put what they learned into action. They start by shadowing anatomy faculty that deliver clinical tutorials using cadaveric prosections. Afterwards, students are required to deliver similar tutorials themselves. In order to prepare them for this step, students first deliver their tutorial to a member of staff after which they receive informal feedback on how to improve, their teaching. Students are made aware that this exercise is not graded and does not affect their final mark.

Assessment Techniques

Different assessment for learning methods are used as part of this course, with the students being part of the process through the use of rubrics that they receive in their course handbook. Figure 3 describes the distribution of marks among the different assessment methods.

The assessment is divided into three main parts. The first one is based on their student-led learning

Table 1. Student Led Learning Rubric.

Criteria	Well Achieved	Achieved	Nearly There	Not Achieved
Content	Information presented was accurate and detailed up to required level. 30 pts.	Information presented was accurate but not detailed enough. 23 pts.	Information presented was mostly accurate and detailed. 15 pts.	Information presented had accuracy issues with superficial content. 5 pts.
Active Involvement	Students were actively working and thinking and participating for the entire session. 20 pts.	Students were able to interact and think in the majority of the session. 15 pts.	Students only participated in a small portion of the session. 10 pts.	Students lecture the class; there is no chance for participation or active learning. 5 pts.
Discussion	Leader was able to stimulate students and create a meaningful discussion. 20 pts.	Leader was somehow able to stimulate the students and create a discussion. 15 pts.	Leader tried to stimulate the students and get a few answers. 10 pts.	Leader was not able to stimulate the students or create a meaningful discussion. 5 pts.
Creativity	Session was delivered in a unique level of originality using multiple methods. 10 pts	Session was delivered in an original way using some methods 8 pts.	Session lacked sincere originality with no new methods. 5 pts.	Session had little or no original thoughts. 2 pts.
Organization	Leader was organized and at ease in front of the class and was able to deliver timely. 10 pts	Leader was somehow organized and was able to deliver timely. 8 pts	Leader showed effort to be organized and deliver timely. 5 pts	Leader was unorganized and fumbles while presenting. 2 pts
Communication Skills	Leader was able to clearly communicate and deliver the planned session 10 pts.	Leader was somehow able to clearly communicate and deliver the planned session 8 pts.	Leader tried to clearly communicate and deliver the planned session. 5 pts	Leader was not able to clearly communicate and deliver the planned session. 2 pts.

session. In these sessions, students are assessed based on content, active involvement, discussion, creativity, organization and communication skills (supplementary Table 1). With this clear rubric that the students receive at the start of the year as part of their handbook, students are made aware and

encouraged ahead of time to start thinking outside the box about how they plan on delivering the session.

The second part is a teaching portfolio that the students are expected to build over the course of the two semesters. This teaching portfolio is divided into 4 chapters. The first one includes a lesson that the students have used to deliver their teaching session. The second one is a reflective essay where the students will use the principles of the scholarship of teaching and learning to identify a teaching or learning problem that they have experienced. The third and fourth parts of this teaching portfolio include reflective essays on the shadowing and teaching experiences.

The final part of assessment on this course is based on the students' teaching practicum. Students are assessed twice: once on their pre-teaching prep and another time during a session. The pre-teaching prep assessment will take place before the start of a teaching session, where a member of staff will use a rubric (supplementary Table 2) to ensure that the students are able to deliver the anatomical content of this season in a clear and effective way. During a teaching session, a member of the staff will usually stand among the students and use the same rubric to assess the teaching process. This rubric is used to assess the students' knowledge of the topic, the use of projections/models, the delivery of learning outcomes, their ability to answer questions, their ability to engage with students, communication skills, time management and professionalism.

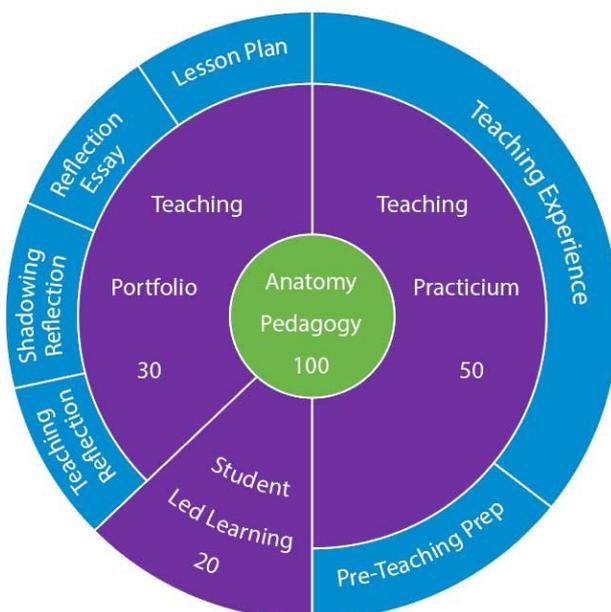


Fig 3. The distribution of marks among the different assessment methods on the Anatomy Pedagogy course of the MSc in Human Anatomy.

Table 2. Teaching Practicum Rubric

Criteria	Exemplary 10 pts.	Accomplished 8 pts.	Acceptable 6pts.	Poor 4 pts.	Unacceptable 2 pts.
Knowledge on topic x2	ST demonstrate an in depth understanding of anatomical principles	ST demonstrate a relatively deep understanding of anatomical principals	ST demonstrate an acceptable understanding of anatomical principals	ST demonstrate a poor understanding of anatomical principals	ST are not able to demonstrate a deep understanding of anatomical principles
Use of prosection/ models	ST are able to use P/M in an exemplary fashion to assist in student learning	ST are able to use P/M in an adequate fashion to assist in student learning	ST are able to use P/M in an acceptable fashion to assist in student learning	ST are using P/M in a poor fashion to assist in student learning	ST are using P/M in an unacceptable fashion to assist in student learning
Deliver learning outcomes	ST are able to deliver all LOs in an exemplary detailed fashion	ST are able to deliver all LOs in a detailed fashion	ST are able to deliver all LOs	ST are able to deliver most LOs	ST are not able to deliver LOs
Answering questions	ST are able to answer all questions in an exemplary fashion	ST are able to answer all questions in an adequate fashion	ST are somehow able to answer all questions	ST are somehow able to answer a few questions	ST are not able to answer questions
Student engagement	ST are able to engage the students meaningfully throughout the entire session	ST are able to engage the students meaningfully at different stages of the session	ST are able to somehow engage the students at different stages of the session	ST rarely attempted to engage the students throughout the session	ST did not attempt to engage the students throughout the session
Communication skills	ST are able to clearly communicate the information in an exemplary fashion	ST are able to clearly communicate the information	ST are somehow able to clearly communicate the information	ST are somehow able to communicate some of the information clearly	ST are not able to communicate some of the information clearly
Organization skills	ST are very organized and at ease with the content and resources	ST are organized and at ease with the content and resources	ST are organized and somehow at ease with the content and resources	ST are relatively organized but not at ease with the content and resources	ST are not organized and not at ease with the content and resources
Time management	ST are exemplary at utilizing the allocated time to deliver content	ST are good at utilizing the allocated time to deliver content	ST are able to utilize the allocated time to deliver content	ST are somehow able to utilize the allocated time to deliver content	ST are not able to utilize the allocated time to deliver content
Professionalism	ST are able to interact in an extremely professional manner at all times	ST are able to interact in a professional manner at all times	ST are able to interact in a professional manner at most times	ST are somehow able to interact in a professional manner at different times	ST are not able to interact in a professional manner

ST= Student Teachers; LO= Learning Outcomes; P/M= Prosection/Models

DISCUSSION

Representation of Knowledge

Universal Design for Learning is at the heart of this course. The diverse styles and varied backgrounds of the lecturers teaching in this course provided multiple ways of knowledge presentation. The faculty from the DAN come from a science background: they are delivering sessions on the SoTL. This is followed by another few sessions delivered by staff from the CIRTL that are delivered to a mix of graduate students coming from different disciplines. Students get to observe how a scientist and a non-scientist approach the scholarship of teaching and learning. Being from diverse background, lecturers end up using different teaching methods that will encourage different ways of thinking.

Another method of representation is peer-to-peer teaching. As part of the course, students have to

deliver a teaching session on an anatomical teaching method. Students are encouraged to use different methods to deliver their sessions as required in their assessment rubric (supplementary Table 1). When it comes to the learning achieved as part of this task, students would have learned a lot about a specific anatomy teaching method, which they presented on, and other methods that their classmates have delivered. Moreover, a diverse list of skillset is learned while achieving that goal. Peer-to-peer teaching or what is also referred to as near-peer teaching has been described as a valuable and effective method for learning. This method has been used when teaching anatomy to medical, dental and healthcare students. When teaching their peers, students are able to effectively communicate the knowledge in methods and styles that they can both relate too (Evans and Cuffe, 2009).

The last method is by observation. The Depart-

ment of Anatomy and Neuroscience at our institution, recruits clinicians/scientists to teach human anatomy in the anatomy laboratory where human materials are used. In these sessions, different cohorts of students (medical, dental, science and health science) take part in an interactive clinical tutorial-based teaching session. Students on this course are required to shadow four different anatomy teachers as they deliver their sessions. During this process, the students are actively trying to learn about teaching by observing the teaching styles of different academics in their field.

Performance of Understanding

Before the start of the students' first teaching session, they take part in a role play where they act as a teacher while a faculty member plays the role of their student. Based on the rubric provided for them, students are aware of how exactly they will be assessed in this activity. This is usually a nerve-wrecking experience for the students, as they are not just being observed on the way they deliver the content, but also on the anatomy knowledge that they demonstrate. The criteria that are used to evaluate the students are their ability to: demonstrate their anatomical knowledge, use dissections/models, deliver learning outcomes, answer student questions, engage the students, clearly communicate the knowledge, deliver in an organized manner, deliver in a timely manner and professionally interact with the students throughout the session. At the end of their delivery, students receive feedback on the different criterion that would help in their delivery of this session.

This activity aligns with Wiske's definition of understanding performances, where the students are not taking part in a routine performance. In this activity, students are able to put what they learned in the first section of this course into action (Wiske, 1998). In the first section of this course, they reflected on this teaching space and how it should be utilized to enhance student learning and now they are able to deliver a teaching session in this space. One of the key aspects that the students learn is the importance of engaging the students, and how they need to be at the centre of the learning process. This activity is a tutorial based session where the student teachers need to engage with the students and they are not expected to just point out structures to them. This is an important aspect as they are being evaluated on their ability to engage the students.

The teaching for understanding framework highlights the ability of the students to practice what they learn in a supportive environment in order to enhance their learning. This is exactly what the students are able to achieve in this session, especially that they are being provided with feedback at the end of the session of improve their performance.

Assessment for Learning

Different assessment methods are used on this course to promote the universal design for learning

aspect of this course. Students with different intelligences have different strengths and by using different methods we are not putting any student in a disadvantaged position. On the contrary, we are trying to help every student identify their strengths and help them improve on their weaknesses.

All of these different delivery and assessment methods revolves around the students, putting them at the centre of the teaching and learning process. This attitude enables them to feel responsible of their own learning, and makes it natural for them to become more involved and always engaged in the process.

In the student-led learning sessions, students are encouraged to use different teaching methods to express their ideas. This could include different types of exercises, which their classmates always find entertaining. Being able to stand in front of their classmates and deliver a teaching session is a challenge that the students positively perceive. When it comes to the teaching portfolio, students receive prompt and instructive feedback. This feedback is divided per section and the students enjoy getting constructive feedback or positive feedback on hard work that they delivered.

When it comes to the teaching component of this course, students are engaged in a completely different way. When delivering a teaching session, students are usually interacting and delivering a clinical anatomy tutorial to medical students. Being able to interact with students, to help them in understanding difficult concepts and answering their questions, gives them a great deal of enthusiasm and appreciation of what they are learning. While some students have found the concept of teaching difficult, they all ended up providing positive feedback on the experience.

Teaching and Learning in Anatomy

What are the implications of such courses for anatomy education? Recent decades have seen a considerable change both in the type of faculty who teach anatomy and in curriculum design in medical education, and we are now in an era in which integrated curricula predominate. This makes it imperative that those who teach anatomy have a solid grounding in disciplinary knowledge *and* also in teaching practice. While many of the techniques and principles will be second nature to the experienced educator, a course such as this, in our view provide a bridge to train the next generation of anatomy educators not only by building their disciplinary knowledge, but also through providing them with opportunities to learn how best to leverage this disciplinary knowledge through the application of a SoTL approach, designed to maximize student learning.

We have currently completed one full cycle of this course and are currently analysing student feedback, using an action research approach which we will use to inform the next cycle. From informal discussions with the students, one of the most useful parts of the course in their view has been the 'application of theory to practice'. Specifi-

cally, this relates to the learning of SoTL principles and in addition being given the opportunity to apply these to their own teaching in a 'real-life' setting. For a course designed to train anatomy educators, this provides an opportunity for these future educators to be 'encultured' into the discipline (Lave et al., 1991), and to learn the 'genres' of the discipline. These have been defined as the ways that a disciplinarian recognizes whether a problem is an important problem, an elegant solution, or even what constitutes a solution in the first place (Seely Brown, 2004). For this reason, future iterations of this course will place a strong emphasis on the practical application of SoTL principles to the teaching and learning of anatomy.

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