Chapter 39
The Use of Digital Software Applications and Digital Atlases to Supplement Anatomy Teaching to Undergraduate Allied Health Students

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ABSTRACT

Teaching anatomy has traditionally been restricted to didactic lectures and cadaveric dissection, where students are required to rote learn, without focus on analysis, conceptualisation, and clinical reasoning. A shift in pedagogical practices has occurred with rapidly developing online technologies now embedded within many university degree programs. Anatomy education has evolved to include new teaching modalities, such as computer-assisted learning including the use of 2D images or 3D models, web-based interactive games, virtual reality, augmented simulation, and haptics. Dissection courses have been found to be time-consuming and expensive, and in many universities, time committed to teaching is on the decline, there are increased costs associated with running body donation programs, and larger student numbers have led to fewer laboratory sessions available to students for learning. This chapter focuses on the use of digital atlases as a useful supplement to teaching anatomy in not only medical but all the allied health professions.

INTRODUCTION

Despite the fact that the study of anatomy is considered a cornerstone of medical practice for those with surgical specialties as well as for allied health professionals (Losco, Grant, Armson, Meyer, & Walker, 2017), there is a continuing debate as to the best way to teach it (Tam, Hart, Williams, Heylings, & Leinster, 2009).

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Historically, teaching a basic science course such as anatomy has been restricted to didactic lectures and cadaveric dissection, relying largely on students rote learning without focus on analysis, conceptualisation and clinical reasoning (Kerby, Shukur, & Shalhoub, 2011; Sugand, Abrahams, & Khurana, 2010). Dissection courses have been found to be time-consuming and expensive, and in many universities, time committed to teaching is on the decline, there are increased costs associated with running body donation programmes and larger student numbers have led to fewer laboratory sessions available to students for learning (Drake, McBride, Lachman, & Pawlina, 2009; Turney, 2007). This has led to a shift in pedagogical practices, with the inclusion of new teaching modalities such as computer-assisted learning (Sugand et al., 2010; Turney, 2007), which may include interactive simulations with 2D images or 3D models, web-based games, virtual reality or online quizzes.

Increased numbers of digital natives - the millennials - raised with rapidly evolving technologies show a decreased tolerance for didactic lecture-style dissemination of course information (Prensky, 2001). Millenials, individuals born between 1982 and 2002 (Wilson & Gerber, 2008), have been exposed to information technology from a very young age, and comprise a large percentage of students currently enrolled in university degree programs. Consequently, many student cohorts are skilled in accessing and utilising new technologies to support their learning (Strauss & Howe, 1991), and splitting attention between styles of instruction, including multimedia, has been shown to help mentally integrate learning.

The majority of research investigating new innovative approaches to teaching anatomy have been undertaken in the area of medical education, and with mixed results (Abid et al., 2010; Codd & Choudhury, 2011; Donnelly, Patten, White, & Finn, 2009; Estevez, Lindgren, & Bergethon, 2010; Garg, Norman, Eva, Spero, & Sharan, 2002; Keedy et al., 2011; Marsh, Giffin, & Lowrie, 2008; Murakami et al., 2014; Nguyen, Nelson, & Wilson, 2012; Nicholson, Chalk, Funnell, & Daniel, 2006; Oh, Kim, & Choe, 2009; ten Brinke et al., 2014; Tworek, Jamniczky, Jacob, Hallgrímsson, & Wright, 2013). There are fewer studies investigating the use of digital technologies in teaching anatomy to each of the allied health professions (Bareither et al., 2013; Hoyek, Collet, Di Rienzo, De Almeida, & Guillot, 2014; Hu, Wilson, Ladak, Haase, & Fung, 2009; Karthikeyana & Ramalingamb, 2017; Levinson, Weaver, Garside, McGinn, & Norman, 2007; Lisk, McKee, Baskwill, & Agur, 2015; Mącznik, Ribeiro, & Baxter, 2015; Maggio, Hariton-Gross, & Gluch, 2012; Nguyen, Mulla, Nelson, & Wilson, 2014; Roach, Brandt, Moore, & Wilson, 2012; Shead, Roos, Olivier, & Ihunwo, 2016; Vuchkova, Maybury, & Farah, 2011). Students enrolled in schools of Dentistry, Physiotherapy, Speech Pathology, Occupational Therapy, Pharmacy, Nursing and Nutrition and Dietetics must take at least one course in basic Human Anatomy as part of their required curriculum, with some students requiring advanced human anatomy courses in later years before undertaking clinical placements.

In many cases, it is believed that traditional teaching methods are suited to practical disciplines and need to be retained, at least in part, rather than be replaced by entirely online courses. The study of anatomy, in particular, benefits from a blend of teaching approaches – traditional cadaveric prosections to be observed in the laboratory, where small table discussion and group interaction is promoted, supplemented by online activities to enhance and consolidate learning, provided that the activities are aligned with the designated learning outcomes. When studying anatomy, in addition to terminology, students learn visuospatial information, including the shape of anatomical structures, their respective positions in 3D space, and their location relative to other structures (Nguyen et al., 2014). Students must be able to visualize this 3D organization in their mind to fully understand the workings of and relationships that exist within the human body (Shaffer, 2004). While this has been the historical goal of the human dissection laboratory, there has been a rapid development of numerous digital anatomy teaching software