



Teaching Anatomy in the Digital Age.

September 2016



“...your students are using digital devices to learn. Can you envisage any capabilities that these devices could bring to enhance your face-to-face teaching?”



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1 Helping students learn anatomy using mobile devices

The teaching of undergraduate and post-graduate anatomy is continually being redefined. Methods used to deliver this teaching are also evolving, including an increased use of visualizations through medical imaging and computer-based resources (Tam, et al., 2010).

Pocket Anatomy represents the next evolutionary stage of e-learning where learning is conducted with a computer or mobile device (such as the iPad, iPhone or iPod Touch). Our applications leverage three-dimensional (3D) visualization techniques so the human body can be rotated and explored in a manner essential for the comprehension of complex spatial and, in some cases, temporal relationships between anatomical features.

Through this approach Pocket Anatomy focuses on the needs of students to learn clinically relevant anatomy with maximum efficiency.

2 Anatomy education

Learning anatomy is seen as essential to medical practice (McLachlan, Bligh, Bradley, & Searle, 2004). In research carried out on doctors seven years post-qualification, gross anatomy was graded as having the highest medical relevance (Pabst & Rothkotter, 1997). It is the foundation of any educational programme in the life sciences, including medicine, nursing, physiotherapy, occupational therapy, sports science, etc.

Typically, anatomy is taught in the early years of an undergraduate or postgraduate medical programme through lectures, cadaver dissections, and more recently using computer-generated models. Professional colleges, such as those responsible for surgical education and training are similarly moving to a core and specialty-specific anatomy syllabus for surgical trainees. For other practitioners, anatomy is taught at various stages within the curriculum, and is frequently seen in continuing professional development programs within specializations or refresher courses.

There are many reasons why people may wish to learn human anatomy either within or outside of an educational programme. A health care practitioner may wish to remain sufficiently knowledgeable in anatomy to deliver safe health care, refresh their training, further their career or simply for personal reasons. Regardless of the motivation, learning about the anatomy of the human body can be challenging, but very rewarding. (Tam, et al., 2010).

3 Benefits for your students

When learning anatomy, students usually have difficulty trying to visualize different aspects of the human body, which inherently are too complex or abstract to fully understand without the aid of useful visual explanations or visualizations. As an example, when studying the origins, insertions, actions and innervation of skeletal muscle, students need to visualize how all components of the human musculature are interconnected. Such visualization cannot be achieved in a textbook and a traditional lecturing environment alone. Learning about the human body takes time and may involve the use of graphical cards, practical lessons using cadaver dissection, and interactive three-dimensional (3D) computer generated images. Many medical professionals believe that such computer models can significantly enhance education in medicine by supplementing current teaching methods (Marks, 2000).

Pocket Anatomy makes it easier to visualize human anatomy. We create interactive and accurate three-dimensional (3D) male and female computer anatomical models as well as detailed stand alone visual information on circulatory, connective tissue, digestive, integumentary, lymphatic, muscular, reproductive, respiratory, skeletal and urinary systems.

"This app is very easy to use and tests a very complex and vast knowledge set with a simplified interface. I wanted an app that I could use to test my anatomy knowledge while on the go because I have so little time to study in the conventional sense. This fulfills this requirement and does so much more! I also very much appreciate the quiz options. Overall great app."



Tamara M. Jette, M.D.

Department of Neurosurgery, Temple University Hospital

3.1 Choice and flexibility

Pocket Anatomy has created an interactive three-dimensional (3D) anatomical visualization application that you can use on your iPhone, iPad or iPod Touch. Simply download it from the App Store and start using it anywhere, with or without an Internet connection. You control the pace, and have flexibility in the place in which you access this next generation learning resource.

3.2 Easy to download and learn on the go

Time-on-task has long been an important predictor of student learning and achievement (Worthen, Dusen, & Sailor, 1994). Having a laptop or mobile device to practice and learn at your own pace, and in your own time is a valuable compliment to attending lectures, and lab tutorials. It makes sense – the more time you have to self-study, the better you will be at understanding human anatomy. Pocket Anatomy offers you a mobile platform on which to interact with resources to increase your comprehension and memorization of key anatomical features.

4 Benefits to instructors

4.1 A supplement to your teaching practice

Anatomists are presented with the challenge of delivering required levels of core anatomical knowledge in a reduced time frame and often with fewer resources (Collins, 2009; Kaimkhani, et al., 2010). Pocket Anatomy supports instructors in meeting this pedagogical challenge by providing novel three-dimensional (3D) models of the human body, which in conjunction with lectures, classes and complementary texts is used to assist students in deeply understanding and effectively mastering human anatomy.

“The first class participating in the (iPad) iMedEd Initiative scored an average of 23% higher on their national exams – taken at the end of the second year of medical school – than previous medical school classes, despite having similar incoming GPAs and MCAT scores.”

Dr. Ralph V. Clayman, Dean of the UC Irvine School of Medicine

4.2 Meeting the challenge of improving assimilation and recall

Deep learning involves understanding information in order to explain and make connections, and is a more useful long-term practice, essential for gaining competency in understanding human anatomy over a professional's career. In contrast, surface learning is the tacit acceptance of information and memorization as isolated and unlinked facts (Ramsden, 2003). It leads to superficial retention of material for examinations and does not promote understanding or long-term retention of knowledge and information.

Several researchers have noted that the assimilation and recall of human anatomy by clinicians post-graduation is sadly lacking. In one study, Waterston and Stewart (2005) received answers from 162 senior clinicians in hospitals affiliated with the University of Aberdeen in Scotland. The majority of clinicians mentioned that the current anatomical education of medical students is inadequate. According to another survey (Cottam, 1999) 57% of the responding U.S. medical residency program directors report that their residents need a refresher course in anatomy, and 14% conclude that their residents are seriously deficient in anatomy. The situation is similar in other parts of the world according to additional research cited by Marks (2000). Therefore, the anatomy educator's challenge is to stimulate interest and curiosity for students to invest effort to master this subject, rather than unpleasant effort and drudgery. Towards this end, the introduction of novel resources to assist with the visualization of the structure and function of the living body is a powerful motivator.

4.3 Visualizations have proven benefits in anatomy education

Visual or spatial skills are also important for learning anatomy (Garg, Norman, & Sperotable, 2001; Hoyek, et al., 2009), and a successful outcome requires a balance between memorization, understanding and visualization. Spatial ability refers to a student's aptitude for understanding three-dimensional (3D) structure and positions of objects when they are manipulated. Studies, such as Luursema, Verwey, Kommers, Geelkerken & Vos (2006) have observed the impact of interactive in an anatomical three-dimensional (3D) reconstruction on learning outcomes. Marks (2000) has noted the increase in the use of three-dimensional (3D) technology in radiology and surgery, and argues that students should be educated and develop competency in interpreting these visualizations in their undergraduate training.

"I find Pocket Anatomy to be an excellent source of information for any Anatomy student in any health discipline. There are many applications out there but Pocket Anatomy is easy to use and provides all the information a student will need. It is easy to navigate and is well worth the investment. I recommend it highly."



David Leigh
Marquette University Milwaukee Wisconsin.

5 The rise of mobile learning

The last decade has seen a surprising development emerge. The smartphone has now become a ubiquitous and omnipresent technology in people's lives. So much so nowadays, it has become an exception to learn of a person who does not own such a mobile device.

"Mobile technology is ubiquitous in the lives of today's college students. Although 83% of adults between the ages of 18 and 29 own a smartphone, mobile device ownership among college students is even higher; according to an EDUCAUSE report, over 86 % of undergraduates own a smartphone, and nearly half (47 %) own a tablet."

Extract from a 2015 Educause Report

'Students' Mobile Learning Practices in Higher Education: A Multi-Year Study'

With the growing number of medical and education applications, or "apps," available for download in Apple's iTunes App Store to date, students and professionals working in the life sciences are already using the iPhone and iPad as a portable medical dictionary, disease image library, drug interaction checker, code finder, and more. This increase in using smartphones for learning is not confined only within the walls of educational institutions. Medical doctors are also keen adopters of this technology.

"Doctors' ownership and use of mobile devices is pervasive, with 87% using a smartphone or tablet device in their workplace, compared to 99% who use a computer."

The June 2012 Manhattan Research/Physician Channel Adoption Study

Q: Can you envisage any capabilities that these devices could bring to enhance your face-to-face teaching?

6 The impact of the iPad on education



On the 27th, January 2010 Steve Jobs announced the iPad to the world. On its release, a debate began almost immediately, with several commentators noting the potential of the iPad to revolutionize education. The iPad's larger screen size, light weight, long battery life, and its price made it immediately attractive.

The application of the iPad for improved access to patient data was also noted for practitioners: "With its much larger, brilliantly lit screen, the iPad has the promise of being a more comprehensive device, pushing physicians away from their desktop computers, where they may eventually be able to perform many of their desktop applications on a mobile computer, everything from viewing radiographs to ECGs." (Berger, 2010).

Several universities have already begun piloting programs to evaluate the impact of iPad devices with students, including Duke University in North Carolina, Macquarie University in Sydney and numerous other US institutions including University of California Irvine, Oklahoma State University, Illinois Institute of Technology, University of Maryland, Reed College, George Fox University, Seton Hill University, and Stanford.

The next stage in the effective appropriation of the iPad in medical education will depend on the availability of good quality educational content, with clear and evidence based support for supplementing learning using this engaging device. Pocket Anatomy is a great example of a medical resource developed specifically for the iPad, ready for use by students and practitioners looking to augment their anatomical training.



7 Features of Pocket Anatomy

7.1 Explore : Tacit Learning

Fly around the human body, fluidly navigating from the skin layer through the superficial to deep musculature, and on through to internal organ structures, ligaments and the skeletal system. Search through 1,000s of anatomical structures such as ligaments, tendons, arteries, veins, organs, and glossary items. Browse by system layers including skin, skeletal, connective tissue, muscular, circulatory, digestive, reproductive, lymphatic, respiratory, urinary and more...Structure, content and usability have been developed to allow the medical student to actively engage with the learning content and dictate their pace of learning.

7.2 Clinically Relevant: 100,000 words of Rich Learning Content

Pocket Anatomy now includes full 3D male and female anatomy as well as detailed stand alone visual information on circulatory, connective tissue, digestive, integumentary, lymphatic, muscular, reproductive, respiratory, skeletal and urinary systems. Anatomical structures in each layer are pinned for identification. Each pin is associated with additional concise relevant information and clinical notes.

7.3 Annotate: Create your own learning content

Users of Pocket Anatomy can create their own content within the app by creating additional user pins, annotating existing pinned structures, and adding accompanying notes, bookmarks and drawings.

7.4 Search: Zoom to anywhere in the body

Confusion is easy when it comes to anatomy terms. With our intuitive search option it will suffice to type in only the first characters of the word you are looking for, or one of the words composing the main term. E.g. if you type in "trap" you will get "trapezoid" as well as "coracoclavicular-trapezoid ligament". The more letters you type the more refined the search.

"One of our Top 5 Apps." **British Medical Association**

"Excellent visuals and seamless 3D navigation" **MedGadget**

"This beautiful app offers mobile medical education for students." **Apple iTunesU**

7.5 Quizzes : Self Assessment

Quizzes are helpful tools to help you know what you know, and more importantly, what you don't know. They can help guide what to spend your time on and how you will organize your study. Pocket Anatomy features built in quizzes which enable you to demonstrate your learning, and to help you identify where you need to improve. These act as a motivating factor by providing a focus for your learning activity.

Quizzes also provide an intellectual challenge and can stimulate your interest to find out more about the human body. Quizzes provide feedback, but their principle purpose is development rather than judgment. By attempting the quizzes at regular intervals, you can maximize the feedback you receive and achieve the greatest benefit.

"User Interface: This is really what separates this app from the rest. Easy and high resolution zooming and movement. Navigating the body couldn't be easier. Of all the anatomy apps I've seen this is definitely one of the best."

U Cal Irvine Medical Student Review

8 Development of Pocket Anatomy

8.1 An App developed by med students, for med students.

The development of Pocket Anatomy has been led by a team of medical experts, consultants, and medical students. In particular, the structure, content and usability have been developed to allow the medical student to actively engage with the learning content and dictate their pace of learning.

The features and benefits sought by these medical students have resulted in a musculoskeletal software application that enables the user to navigate from skin level, through the superficial to deep musculature, and on through to ligaments and the skeleton. In addition, concise relevant information is presented for each structure, including clinical notes, as well as the ability for students to add their own clinical notes.

As well as medical students, our research suggests that this application also assists nursing, allied health and science students with their human anatomy studies in preparation for examinations, as well as being a continuing anatomy resource throughout their degree programme and on into the professional workplace.

8.2 Development Team

We are a team of healthcare professionals, educators and interaction designers passionate about bringing you the most meaningful and beautiful mobile medical education software.

Our growing community of 1 Million users are becoming better medical educators and professionals by learning, refreshing and going the extra mile for their students and patients.

We are committed to offer you the best updated content to help you enhance your anatomy learning experience.

We are an Irish company, and have been in business for ten years. Our company started as a web and eLearning design company for the life science industry in 2007, and have been at the forefront of medical education app development since 2010.

9 Contact Us



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