Section 1

Introduction

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Background

A busy veterinary clinic is probably not the best starting point to learn and practise clinical skills. Although the student can experience, observe and learn from the busy clinic it is not a safe and calm environment to learn a new skill; the presence of large or small animal patients, anxious clients, a veterinary team stressed and pressed for time and a multitude of clinical procedures may all hinder efficient learning. The starting point of a new skill should ideally happen elsewhere, away from onlookers and without risk to the patient.

The simulated environment created in a clinical skills centre (CSC), though far removed from the messy and complex clinical situation, is quiet and safe: the student can make mistakes, repeat procedures and learn from these to practise a skill until they are competent and confident. How does learning happen in a CSC? Can the skills be taught and learnt in an effective manner? Is there a correct way to guide the student? These are some of the questions that we answer in this introductory section of the book.

There is a growing body of evidence-based knowledge on learning theories and principles that contribute to effective learning. As more and more veterinary teaching institutions are moving towards competence/outcome-based curricula, it is necessary to understand how to guide our students and trainee tutors to develop these skills. A body of underlying knowledge is essential to perform an effective clinical skill and both educators and students should be fully aware of this before starting to teach and learn a clinical skill. The introductory section of this book explores the underlying theories that support student learning and how the trainers/educators can effectively use these theories and concepts to support student learning in a CSC environment. The aim is to provide an evidence-based approach, using examples from well-established and developing CSCs from around the world.

Within this section there are three chapters as outlined below.

Chapter 1: Developing Veterinary Clinical Skills: The Pedagogy

Chapter 2: The Modern Outcome-based Curriculum and the Role of the Clinical Skills Laboratory

Chapter 3: The Clinical Skills Centre Models Relevant to Location

Chapter 1 explores learning theories that underpin and enhance skills teaching, such as active learning, emotions that impact learning and how to overcome barriers such as fear, anxiety and lack of confidence. Chapter 1 provides essential knowledge for tutors to help them to utilize the principles of skills teaching and best practice guidelines on how to provide students with formative feedback. For students, Chapter 1 explains why CSCs provide an opportunity to move from a novice level of skill to competence and the advantages of participating in structured simulations and practicse within a supported and safe learning environment.

Chapter 2 explores the modern veterinary curriculum and the competences to be expected as an outcome of following an accredited veterinary degree. The growing demands exerted by national, regional and global veterinary curricula are to produce competent graduates who can perform immediately in the clinical workplace, rather than just having theoretical knowledge about a skill. The CSC can create opportunities to practise skills that are identified as outcomes by the curriculum. In Chapter 2 an attempt is made to answer how and what to teach as essential skills for veterinary and para-veterinary undergraduates. These experiential learning opportunities are designed to closely mimic (or to resemble) the clinical workplace.

Chapter 3 describes the successful practices of the growing number of CSC labs from different parts of the world. It shows how CSCs have adapted the core veterinary curricula to provide appropriate learning outcomes for local students and local community needs. In addition, Chapter 3 describes how successful CSCs promote self-directed learning through the provision of drop-in or appointment-based access.

1 Developing Veterinary Clinical Skills: The Pedagogy

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The clinical professions are science based. This is part of the 'social contract' that in the case of the veterinary profession has led, in countries such as the UK, to monopoly powers for qualified individuals when it comes to the diagnosis and treatment of disease in animals (May, 2013). Society grants to veterinarians the privilege of caring for its animals provided that the profession regulates itself in a way that recognizes the need for its members to remain evidence based and up-to-date, and to look after the interests of animal owners and keepers by recognizing their needs and charging reasonably for the services provided (Rollin, 2006). In the century since Flexner's influential report on the quality of US medical education (Flexner, 1910), this has led to a considerable focus on scientific knowledge and the content of clinical curricula (Finnerty *et al.*, 2010), at times to the detriment of the balanced knowledge and skill set required by the practitioner (Christakis, 1995).

In the UK, the state of medical education was addressed by the General Medical Council in its first edition of *Tomorrow's Doctors* (GMC, 1993), when it called a halt to the overburdening focus on the passive acquisition of knowledge by students in a way that 'taxed the memory but not the intellect'. Medical schools were exhorted to define core knowledge so that their updated curricula enabled students to understand the principles of their discipline and have time to develop basic technical skills, as well as enhancing the attitudes and behaviours of the students as professional practitioners. Similar recognition of the mismatch between the attributes of new graduates and the requirements of society have led, in both the USA (Pritchard, 1988) and the UK (RCVS, 1991), to calls for a greater focus on the application of knowledge and problem solving, rather than the accumulation of facts, as well as the acquisition of basic technical and professional skills (RCVS, 2001; NAVMEC, 2011).

The Flexnerian curriculum, with its preclinical and clinical phases, is inefficient and ineffective in various ways (Harden, 2000). The persistence of the separate '-ologies' has contributed to the content overload, with rapidly accumulating knowledge in each separate field encouraging each discipline to specialize to ensure that it is covered in their teaching block. The reductionism of the basic sciences means that they are increasingly focused on cells and molecules, rather than whole animals, and the ever more technologically sophisticated university teaching hospital is an unfamiliar and challenging learning environment for the new clinical student familiar with the 'safer' environment of the classroom. In the absence of vertical integration of the Flexnerian curriculum, this led to an enhancement of the so-called preclinical–clinical divide (GMC, 1993; Parsell and Bligh, 1995), making it harder than ever for students to reorganize their knowledge from a disease-focused to a problem-focused framework necessary for its application in the clinics (May, 2015). Fortunately, in parallel with the call for more professionally oriented and better balanced clinical curricula, progress in our understanding of student learning and the process of development from novice to expert has allowed the breadth of core knowledge, skills and attitudes to be incorporated into pedagogically sound frameworks (May and Silva-Fletcher, 2015) that ensure that the 4–6 years (depending on whether this is an undergraduate or postgraduate qualification) are used both more effectively and efficiently.

1.1 Active Learning

It is well recognized that while a small number may theorize and mentally extrapolate beyond what they are hearing, if a cohort of students is placed in a traditional lecture, the vast majority will adopt a more passive approach to note taking and memorizing (Biggs, 1999). Those in the latter group need to be actively engaged in various tasks and problem solving to ensure that they

start to integrate their knowledge and apply it in a meaningful way (Prince, 2004; Prince *et al.*, 2009; Freeman *et al.*, 2014). This has implications for both cognitive skills, such as critical thinking and the understanding of scientific concepts (Nelson, 1999), and the technical skills associated with surgical and medical therapies (Bradley and Postlethwaite, 2004; Baillie *et al.*, 2010). Active, small-group learning provides the context for the realization of all three major categories of learning – behaviourism, cognitivism and social constructivism – recognized in the last century (May, 2017). It stimulates cognitive processes as the learner adapts and applies their knowledge to a problem. It supports the social process that allows individuals to learn from one another and reconstruct their concepts of science and clinical practice as their understanding deepens. With opportunities for repetition of practical tasks, it supports behaviourist responses that lead to automaticity of increasingly complex cognitive and practical processes.

1.2 Deliberate Practice

The idea that individuals are either clever/intelligent/talented or not, and that there is little that they can do to alter their part in the genetic lottery, is a pervasive and destructive belief that still hampers a student's ability to achieve their full potential (Dweck, 2006). In early adolescence, individuals start to differentiate into two groups: those who have a fixed mindset, see failure in a task as a reflection on them and identify experiences for future avoidance; and those who have a growth mindset, see failure as a challenge to be overcome, and an opportunity for learning that should be sought if they are to make progress (Dweck, 2003, 2007). The fixed mindset develops despite evidence, from a variety of fields of endeavour, that expertise is more related to the hours in which an individual engages in study and practise rather than any initial aptitude for a discipline (Ericsson, 2004). Achievement of solo performance standard on a musical instrument is a good example of this, with those who succeed all devoting in excess of 10,000 h of deliberate (structured/sequenced) practise to mastery of their instruments, in contrast to less accomplished professional musicians (5000–7500 h) and amateur musicians (2000 h). Behaviourism predicts that more repetition of any task, cognitive or practical, leads to automaticity, which, for simple tasks that are either completed or not, such as tying a knot, is likely to be a desired end point. However, where, like musical performance, there are qualitative differences in the way in which a task is completed, and where superior performance is only achieved through an iterative process of action and feedback, deliberate practise allows this tendency to automaticity to be overridden and continued improvements to be made (Ericsson, 2009). For complex skills, this deliberate practice may include repetition of individual elements and ensuring that the less successful elements are refined. In domains such as ballet and music, the best ordering of study materials for student development has evolved over hundreds of years; in contrast, in clinical education and scientific research, there is much less consensus over best practice. This emphasizes the need for research on the best approaches for educating clinicians and the development of their teachers (Lynagh *et al.*, 2007; May, 2008, 2017; Silva-Fletcher, 2017).

1.3 Curricular Integration

Historically, professional programmes were populated by the allocation of blocks of classroom time to different departments, with ownership of the content belonging to those separate groups (Harden, 2000). This accounts for the tendency towards overload and the lack of meaningful sequencing of knowledge and skills development. It was up to students to horizontally integrate anatomy, physiology, pathology and pharmacology, navigate the practical–clinical divide (Parsell and Bligh, 1995) and make sense of abnormal biological processes and their treatment (May, 2015). An appreciation of the power of active learning and deliberate practice confirms the superiority of curricular models founded on horizontal integration around systems of the body and vertical integration of concept and skills development (GMC, 1993; Harden, 2000) that avoid cognitive overload (van Merriënboer and Sweller, 2010).

1.4 Anxiety and Learning

An individual's capacity to learn is affected by their emotional state. In particular, when placed in a group, anxiety causes them to focus their mental processes more on social survival than any learning opportunities that the particular context provides (Rogers, 1969).

Until recently, progress in a professional curriculum meant that students often moved from the anonymity of the large-group learning environment of the lecture theatre to the small groups of clinical rotations, at the same time as struggling to cross the preclinical–clinical divide. The busyness of increasingly commercial university-owned clinics, together with the complexity of the clinical environment, could make this transition a very anxious one for many students (May, 2015), particularly those with a tendency towards a fixed mindset (Bostock *et al.*, 2018). This process has been likened to learning to swim by being dropped, as a non-swimmer, into a pool with a mixture of others with ranging degrees of swimming expertise. Some might learn to survive individually; others might be helped by more advanced colleagues (Wearn and Bhoopatkar, 2005). Either way, a considerable amount was left to chance and the novice learner's survival instincts. Sequencing of learning so that it encourages understanding and mastery (van Merriënboer and Sluijsmans, 2009), providing opportunities for rehearsal and gaining fluency in basic techniques before moving on to the more complex (Ericsson, 2009), and integrating bridges between the classroom and the workplace, in the form of safe environments in which to observe and practice technical skills (May and Silva-Fletcher, 2015), are all likely to contribute to confidence that the transition can be accomplished and a reduction in anxiety.

1.5 The Veterinary Clinical Skills Centre

Veterinary Clinical Skills Centres (CSCs) are based on facilities similar to those created by medical schools to develop technical skills in their students. In 2001, the Royal Veterinary College (RVC), University of London, secured external funding for a series of visits by faculty from several UK veterinary schools to medical CSCs in Dundee, Sheffield and London. These were in support of a feasibility study to decide what was needed and whether it would be practical to convert the medical model for the CSC to the veterinary context. This led, during the course of 2002, to the identification of space for redevelopment (a large, redundant clinical research area that was tiled and had a washable floor) and the creation of the RVC's first pilot CSC, which, like the medical CSCs on which it was based, provided relevant learning opportunities in a 'safe' environment, in a systematic way, that ensured important curriculum outcomes were achieved by all students and not left to chance, and provided a foundation that students could 'use as a springboard from which to achieve the best possible learning from subsequent clinical experience' (Bradley and Bligh, 2005). It was immediately popular with students, for whom it had huge face validity, as they recognized that it focused on skills that they were actually going to have to perform as vets. This first facility provided a model for the development of improved facilities at other schools in the UK and internationally and led, through the Higher Education Funding Council for England's initiative to create Centres for Excellence in Teaching and Learning, to the RVC's Lifelong Independent Veterinary Education (LIVE) Centre (Pirkelbauer *et al.*, 2008), incorporating two purpose-designed clinical skills laboratories, as well as rooms for learning communication skills and facilities that support computer-aided problem solving.

1.6 Feedback

Important to successful learning in the CSCs is the ability to role-model skills for learners, observe their performance and provide timely and meaningful feedback (Bradley and Bligh, 2005). Technical skills development invites behavioural feedback of a type that contributes to improved future performance. The acknowledgement of student effort rather than praise of student 'talent' is important for all learners in helping them to adopt a growth mindset in their professional development (Dweck, 2007). Feedback that provides compliments is liked by students (and increases satisfaction scores on feedback forms), but does not improve future performance. In contrast, feedback focused on student activity leads to improved future performance at the expense of student satisfaction (Boehler *et al.*, 2006), demonstrating that we do not always like what is good for us.

1.7 Effectiveness of Clinical Skills Centres

CSCs incorporate a range of models, from the very basic that provide a framework for learning to tie surgical knots, through simple manikins (life-sized models)

that support the development of skills in venepuncture and catheterization, to much more sophisticated simulators, such as the 'haptic cow' (Baillie *et al.*, 2010), that aid the development of manual palpation skills. In the early days of simulator development, fidelity of the model to the real patient was viewed as important. However, it is now clear that a basic model or a more advanced simulator only needs to be 'real' enough to draw the learner into a relevant learning experience. Similar learning gains are achieved for high- and low-fidelity simulators in auscultation, critical care and basic surgical skills (Norman *et al.*, 2012). An important caveat in this regard is the assessment of many CSC-acquired skills through *in vitro* 'shows how' methods (objective structured clinical examinations, or simulator-based assessments), rather than through assessment of their transfer to clinical contexts, and thus the fact that early evaluations of CSC effectiveness were based on comparisons of those assessments with structured or no skills training (Lynagh *et al.*, 2007). However, there is increasing evidence that skills do transfer to the clinical context, through evaluations of simulators such as the haptic cow (Baillie *et al.*, 2005).

1.8 Aggregation of Technical and Other Professional Skills

Proficiency in technical skills is most easily achieved for simple, isolated skills. However, a criticism of the reductionism of the CSC approach is the way in which skills learning and their assessment through objectively structured clinical examinations (OSCEs) fails to encourage and evaluate student proficiency in a complete surgical procedure (for instance, neutering of cats) or the handling of all aspects of a clinical case (May and Head, 2010). In line with understanding of the development of expertise, this has led to the integration of role playing with technical skills training. In medical education, adding these extra elements did not detract from technical skills development and led to significant improvement in patient–physician communication (Nikendei *et al.*, 2007), and these types of integrated learning experiences were also significantly more valued by participating students (Nikendei *et al.*, 2005). A similar integrated skills scenario focused on a farm visit and a pregnancy assessment in a cow has been researched in veterinary education. Students reported positive effects on their confidence and knowledge, as well as their communication and technical skills (Baillie *et al.*, 2010). The challenge created by the facilitator taking on the role of farmer was seen as 'putting them on the spot' and provoked some anxiety. However, this was seen as 'not a bad thing', as this experience was 'so important for the real world'.

Conclusions

The CSC provides many opportunities to incorporate best practices in learning and teaching, in relation to 'active learning', deliberate practice, sequencing of skills and a safe environment in which to experience challenging and anxiety-revealing scenarios, in a way that supports the development of understanding and avoids excessive cognitive loads. Important to this is facilitator understanding of underpinning pedagogies and appreciation of the way in which CSC-supported learning fits into an integrated curriculum and bridges the classroom–clinic divide. This requires facilitator training and the recruitment of individuals as facilitators who are student focused and can empathetically accommodate all types of learner. Like in many medical CSCs, the RVC's experience is that trained veterinary nurses (in the US, veterinary technicians) excel as CSC facilitators and are seen as approachable by veterinary students. This means that timetabled CSC learning opportunities are well attended and 'drop-in' sessions continue to be popular with clinical students, depending on their needs, throughout their final year of veterinary education.

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