THE UNIVERSITY *of* EDINBURGH

Development and Evaluation of Peer Assisted Learning (PAL) in the Veterinary Curriculum: A foundation for a new Undergraduate Certificate in Veterinary Medical Education

Nigel Huw Stansbie

MSc by Research (Veterinary Medical Education)

The University of Edinburgh

2017

Declaration

‘I have read and understood The University of Edinburgh guidelines on plagiarism and declare that this written dissertation is all my own work, except where I indicate otherwise by proper use of quotes and references, and has not been submitted for any other degree or professional qualification.’

Nigel Stansbie

Table of Contents

Table of Figures

Table of Tables

Table of Abbreviations

PAL	= Peer Assisted Learning
MCQ	= Multiple Choice Question
UCVME	= Undergraduate Certificate in Veterinary Medical Education
R(D)SVS	= Royal (Dick) School of Veterinary Studies
GMC	= General Medical Council
HEA	= Higher Education Academy
UKPSF	= United Kingdom Professional Standards Framework
GEP	= Graduate Entry Programme
LCME	= Liaison Committee on Medical Education
ACGME	= Accreditation Council for Graduate Medical Education
USMLE	= United States Medical Licensing Examination

Abstract

A definition of Peer Assisted Learning (PAL) widely accepted with in the published literature is: 'people from similar social groupings, who are not professional teachers, helping each other to learn and learning themselves by teaching' (Topping 1996). PAL has been used informally as a teaching methodology in medical education for many years, but has grown in popularity in more recent times due to the general acceptance among the medical profession that teaching students is an essential part of a junior doctor's job description. This view has been formally recognised in the UK by the General Medical Council (GMC) (GMC 2003). PAL has been used as a teaching methodology at the Royal (Dick) School of Veterinary Studies over a number of years in a range of contexts, both informally and formally as part of the veterinary undergraduate curriculum.

The aim of this project was three fold; 1) To evaluate the perceived effectiveness and popularity of PAL as a methodology for teaching equine and canine clinical examination skills among veterinary undergraduates using qualitative post-intervention feedback data. 2) To quantitatively analyse the results of a multiple choice question (MCQ) study designed to test whether experiencing PAL improved the knowledge of veterinary undergraduates relating to canine clinical examination. 3) To introduce and test the concept of an Undergraduate Certificate in Veterinary Medical Education (UCVME) amongst potential stakeholders and evaluate the programme at the end of the first year.

Qualitative feedback data relating to the equine and canine clinical examination skills PAL intervention has been collated annually since 2010/11. This project came into being in part because analysis of this large body of data was considered to be a valuable addition to the current published literature pertaining to PAL. Analysis of the post-intervention feedback data obtained from 1st year/Graduate Entry Programme (GEP) tutees and 4th year tutors showed that PAL was perceived as a valuable teaching methodology. The results also suggested that the PAL clinical skills course provided a valuable opportunity for tutors and tutees to enhance their examination and tutoring skills and knowledge. Tutee feedback also suggested that, at the point of execution, 4th year tutors were perceived by their tutees to have the skills required to deliver effective PAL interventions.

The MCQ study, devised as an attempt to quantify any improvements in the student's knowledge as a result of experiencing the PAL intervention, was implemented to build on the analysis of the qualitative feedback data. The body of published literature describing attempts to quantify the benefits of PAL in relation to the academic performance of students, is considerably smaller than that relating to the qualitative benefits of PAL and therefore the results of the MCQ study had the potential to be an important addition to the literature. The MCQ study comprised a crossover study design that incorporated a control group. 1st year/GEP tutees and 4th year tutors were asked to complete one set of multiple choice questions before the canine clinical skills PAL session and a different set of questions

immediately after the intervention. The results from the study were inconclusive with regard to demonstrating a change in knowledge, but did highlight several areas for future research.

While the importance of developing teaching skills in undergraduate medical students has been formally recognised, the number of published articles describing formal teacher training programmes run by medical schools, while growing, is still small. There is also large variation in the format, content and duration of the programmes that have been described. The concept of the UCVME was introduced to provide a structured teacher training programme and formally recognise development of teaching skills in the undergraduate veterinary curriculum. The hope of the R(D)SVS, if the UCVME is successful, is that the veterinary governing bodies will, like their human medical colleagues, formally recognise the importance of developing teaching skills in veterinary undergraduates.

A needs analysis was undertaken with veterinary undergraduates and members of the veterinary profession to inform the content, design and perceived value of the UCVME. This indicated that the concept of the programme would be well received and considered a worthwhile exercise across all the cohorts surveyed. Uptake levels amongst eligible students, combined with the positive feedback received from students who have completed the first year of the programme, supported the findings of the pre-UCVME survey. Evaluation results identified suggestions for minor changes and modifications to the UCVME, however overall, feedback from candidates suggested that the design and implementation of the UCVME had been well received.

Acknowledgements

I would like to thank the Principal's Teaching Award Scheme (PTAS) of the University of Edinburgh and the Higher Education Academy for providing funding for this project. I would also like to thank my supervisors Dr Catriona Bell and Dr Neil Hudson for their help and support over the last two years and Dr Ian Handel for his guidance on statistical analysis of the data. Dr Bell was responsible for running the Canine Clinical Examination Skills PAL classes and also leading the pre-intervention plenary briefing and post-intervention round up sessions. Dr Hudson ran the Equine Clinical Examination Skills classes and was also the staff member responsible for running the UCVME programme. Dr Handel provided assistance with the design of the MCQ study and the statistical analysis of the feedback questionnaire and MCQ study data.

Finally and most importantly, I would like to thank the students of the R(D)SVS who, over the years, have taken the time out of their busy schedules to fill in feedback questionnaires, without which we would not have been able to build the large and valuable database on which this study was based.

Author's Background and Influence on the Research

I graduated from the R(D)SVS in 2007 and have spent the last nine years working in first opinion small animal practice. As an undergraduate, I completed a summer research project with the Veterinary Teaching Department at the vet school and through this developed an interest in veterinary teaching and education at both undergraduate and postgraduate level. As an undergraduate at the R(D)SVS, I also experience the various PAL interventions included in the curriculum both as a tutee and tutor. Following graduation, I maintained contact with the teaching department at the R(D)SVS and for a short time was a member of the Clinical Skills Committee which was established to improve the teaching of clinical skills to undergraduates. Through these connections I was approached to take part in this MSc research project when the opportunity arose.

With regard to my influence on the research conducted as part of this project, It was my idea to introduce the MCQ study and I was responsible for its design and implementation. The UCVME concept was in existence prior to my involvement in the project but, the idea and development of the modular course structure and points system, alignment with the Higher Education Authority Professional Standards Framework and the creation of all the relevant documentation required for the student portfolio was entirely my own work.

Ethics and Project Review

Ethical Approval

Over-arching ethical approval was sought and granted for all elements of this study including the Peer Assisted Learning (PAL) feedback questionnaires, the Multiple Choice Question (MCQ) study and the Undergraduate Certificate in Veterinary Medical Education (UCVME) from the College of Medicine and Veterinary Medicine Education Research Ethics Committee (EREC) (April 2014).

The PAL canine clinical examination classes were compulsory timetabled activities and therefore completion of the standardised evaluation form was a formal part of this curricular activity. However, it was made clear to the students that they were at liberty to hand in a blank or incomplete form if they so wished.

Participation in the MCQ study, which ran alongside the PAL canine clinical examination classes, was entirely voluntary and this was made clear to the students at the introductory formal briefing stage. Signed informed consent was obtained from volunteers who did participate and all data were anonymised. It was also made clear that the postgraduate student (Nigel Stansbie, NS) was the only individual to have access to non-anonymised data and that he was not involved in the teaching or assessment of BVM&S students.

As part of the UCVME project, voluntary short paper based, anonymised questionnaire surveys were undertaken with undergraduate students and practising veterinary surgeons to inform the development of the UCVME. This survey received ethics approval from the local R(D)SVS Students Survey Overview Group and was completed in December 2013. In relation to quotes included in the Medical Teacher paper (Appendix D), stakeholders and participants were approached in writing and asked on a voluntary basis to provide written quotes for use in dissemination of the UCVME findings on websites and in publications.

Project Review

This project was initially reviewed internally by the project team. The Roslin Institute Senior Management Group then approved a summary concept note prior to submission to the University of Edinburgh Principal's Teaching Award Scheme (PTAS) funding bid. Peer review of the final project was undertaken by the PTAS Review Panel.

Chapter 1 Introduction and Literature Review

1.1 Introduction

Peer Assisted Learning (PAL) has been used informally at the R(D)SVS for a number of years for the consolidation of clinical examination skills across small animal, equine and farm animal disciplines. The popularity of this teaching methodology has in more recent years led to the incorporation of PAL into the veterinary undergraduate curriculum on a more formal basis. Table 1.1 taken from a poster presentation given at the Vet Ed Conference in 2014 (Hudson et al. 2014), summarises the current use of PAL at the R(D)SVS and illustrates the commitment of this institution to PAL as a teaching methodology. In addition to this, faculty members of the R(D)SVS were responsible for the development of the pastoral-based student Peer Support programme (Spielman et al. 2015) and an academic PAL programme, VetPALs.

Topic	Tutors	Tutees	Format
Canine Clinical Exam	4th Year	1st Year/Graduate Entry (GEP)	Healthy dogs; small groups; teaching aids
Canine History & Clinical exam	Final Year	3rd Year	Healthy dogs; small groups
Equine Clinical Exam	4th Year	2nd Year/GEP	Healthy Horse; small groups
Equine Medicine/Clinical Exam	Final Year: Equine Medicine Rotation	3rd Year	Equine Hospital case-based; small groups
Equine Surgery	Final Year: Equine Soft Tissue & Orthopaedics Rotation	3rd Year/4th Year	Equine Hospital case-based; diagnosis & therapy
Farm Animal Medicine/Clinical exam	Final Year: Farm Animal Rotation	3rd Year/4th Year	Farm Animal Hospital case-based; diagnosis and therapy

Table 1.1 A table to show the range and format of the clinical skills PAL classes that currently form part of the undergraduate veterinary curriculum at the R(D)SVS and the composition of the tutor and tutee cohorts involved in each intervention.
(Source: Poster presentation at VetEd Conference 2014 "Peer Assisted Learning (PAL) in veterinary clinical training: an increasing role in the Edinburgh Veterinary Undergraduate Curriculum." Hudson et al. 2014)

Since 2010/11 1st year and Graduate Entry Programme (GEP) student tutees and 4th year student tutors have been asked to give feedback relating to the PAL classes with which they have been involved using a standard course evaluation survey. As a result of this, three full academic years (2010/11,

2011/12 and 2012/13) of data had been collated prior to the commencement of this postgraduate programme.

The aims of this MSc research study were three fold:

1) To evaluate the perceived effectiveness and popularity of PAL as a methodology for teaching equine and canine clinical examination skills amongst veterinary undergraduates using qualitative post-intervention feedback data.

2) To quantitatively analyse the results of a multiple choice question (MCQ) study designed to test whether experiencing PAL improved the knowledge of veterinary undergraduates relating to canine clinical examination.

3) To introduce and test the concept of an Undergraduate Certificate in Veterinary Medical Education (UCVME) amongst potential stakeholders and evaluate the programme at the end of the first year.

The reason for implementing the MCQ study was to build on the qualitative feedback given by the students in the standard evaluation survey by quantitatively assessing the effect of PAL on the canine clinical examination knowledge of the student tutors and tutees. The concept of the UCVME referred to in the third aim of this study, evolved from the desire of the R(D)SVS to give the students formal recognition of their important role in teaching and learning processes, by enabling them to use constructively and educationally their experiences and evaluations of PAL and other teaching initiatives.

The body of this study is divided into three main sections; Chapter 2 covers the evaluation of the canine and equine clinical examination skills PAL interventions run at the R(D)SVS from 2011 to 2014, Chapter 3, the Multiple Choice Question (MCQ) study evaluating potential change in knowledge following participation in a PAL canine clinical examination skills intervention carried out in 2015 and Chapter 4 is an introduction to and preliminary evaluation of The Undergraduate Certificate in Veterinary Medical Education (UCVME), which was formally launched in May 2014. Each of these main chapters are divided into methodology, results and discussion sections, with overall discussions and conclusions included in Chapter 5 toward the end of the thesis. The Appendix is divided into four sections A, B, C and D, with section A containing documents relating to the PAL canine and equine clinical skills interventions, section B containing documents referred to the MCQ study chapter and section C containing documents relating to the UCVME.

1.2 Literature Review

1.2.1 Introduction

The literature review for this thesis was performed online using the PubMed database, provided by the US National Library of Medicine, via the Endnote X7.2 software package produced by Thomson Reuters. The initial search query was 'What is Peer Assisted Learning?' with individual words and combinations from this phrase then used to further explore the database. The investigation then became more focused through the addition phrases such as 'PAL & medicine', 'PAL & veterinary medicine' and 'students as teachers' to the search criteria. Searches were then repeated across other platforms including CAB Abstracts and the Education Resources Information Center (ERIC) databases and online journals such as Medical Teacher and the Journal of Veterinary Medical Education were searched directly. Colleagues involved in this project also recommended key papers and the reference sections of sourced papers were also used to expand the search. The overall aim of the literature review was to build an overview of how PAL is currently used in medical and veterinary undergraduate degree programmes and identify how this project would add to the body of research.

1.2.2 Definition of Peer Assisted Learning (PAL)

A definition of Peer Assisted Learning (PAL) widely accepted with in the published literature is: 'people from similar social groupings, who are not professional teachers, helping each other to learn and learning themselves by teaching' (Topping 1996, Kam et al. 2013). The phrase 'by teaching' distinguishes PAL from other forms of group activity and cooperative learning, because within the cohort of a PAL session there is a clear hierarchical structure where one or more tutors are responsible for teaching one or more tutees (Nestel & Kidd 2005, Ross & Cameron 2007). An additional key point of note when defining PAL is that while tutors in most cases will have more extensive knowledge of the subject matter covered in a PAL session, they are not considered professional teachers or experts and therefore do not possess the teaching skills or authority that would typically accompany these professional roles (Ross & Cameron 2007). Several studies have shown that tutees may develop and expand their knowledge of the subject matter covered within a PAL session whereas tutors may benefit by improving their teaching and communication skills (Topping 1996, Ross & Cameron 2007, Baillie et al. 2009). 'Helping each other to learn' is therefore another key phrase when defining PAL (Ross & Cameron 2007).

1.2.3 History of PAL

The use of peer tutoring as a teaching methodology is not new and can be traced back centuries to ancient Greece, where student tutors taking the role of surrogate teacher, provided an intermediate step in the linear transition of knowledge from teacher to tutor to tutee (Topping 1996, Hill et al. 2010). More recently it was realized that there are significant qualitative differences in the way peer tutors and tutees interact in a teaching session compared with teacher and student teaching scenarios (Topping 1996) and as a result, PAL stepped away from the traditional didactic teaching model and became a teaching methodology in its own right. PAL is therefore now recognised as an alternative teaching methodology to didactic teaching that can be used to improve student skills and knowledge and has recently become an established teaching methodology within the UK (Wadoodi & Crosby 2002, Baillie et al. 2009).

1.2.4 PAL in Medical Education

PAL has been used informally to teach medical students for centuries and even though the more formal use of PAL in medical education is a relatively new development, there has been significant recent expansion of the body of literature describing a range of different models of PAL used in this field (Nestel & Kidd 2005, Ross & Cameron 2007, Hill et al. 2010, Mabvuure et al. 2013). A driving force behind this growth in the UK was the publication by the General Medical Council (GMC) of 'Tomorrows Doctors' a set of outcomes that undergraduate medical students should demonstrate at the point of graduation. This included the outcome that medical graduates must 'be able to demonstrate appropriate teaching skills' (GMC 2003). Similarly in the USA, the Liaison Committee on Medical Education (LCME) and the Accreditation Council for Graduate Medical Education (ACGME), which are the major accrediting bodies that oversee medical student and resident training, have also stated that teaching is a necessary skill that medical trainees must develop (ACGME 2013, LCME 2015). In addition to this, modern healthcare professionals are expected to be able to work effectively as part of a team and engage in lifelong learning (Ross & Cameron 2007). These more recent developments have encouraged curriculum developers to look for ways in which they can provide opportunities for undergraduate healthcare students to develop their teaching skills. (Burke et al. 2007, Ross & Cameron 2007). The use of PAL in a range of different contexts has been shown to help students develop in these areas and as a result there has been increasing interest both in the UK and internationally in adopting a more formal approach to PAL in both undergraduate and postgraduate healthcare education (Ross & Cameron 2007).

1.2.5 Examples of PAL in Medical Education

Review of the published literature suggests that PAL has been used mostly in medical education for the teaching of clinical skills. The range of subject matter covered however spans the spectrum of this wide and diverse topic and includes history taking (Nestel & Kidd 2005, Cushing et al. 2011), cardiovascular and respiratory system and gastrointestinal tract exam (Field et al. 2007), the musculo-skeletal system (Burke et al. 2007), peripheral vascular exam, neck exam and fluid management (Hill et al. 2010), nursing clinical skills (Brannagan et al. 2013) clinical childbirth skills (McLelland et al. 2013) and resuscitation training (Perkins et al. 2002, Hughes et al. 2010). While reports of the teaching of clinical skills dominate, PAL has also been used for surgical skills training (Beard et al. 2012), to teach communication skills to medical students (Glynn et al. 2006) and on a more theoretical basis to teach anatomy (Plendl et al. 2009) and gastroenterology and haematology (Peets et al. 2009). Interestingly in 2015 Nazha et al. developed a PAL intervention to investigate the experiences, perceptions and attitudes of medical students towards medical research and future careers in academia (Nazha et al. 2015). This range of different models and subjects illustrates the flexibility of PAL and the growing popularity and acceptance of this teaching methodology within mainstream medical education. The flexibility of PAL is further illustrated in the literature by examples of its use as an interdisciplinary teaching methodology. McLelland et al. (2013) for example developed a PAL model where midwifery students developed workshops in clinical childbirth skills for paramedic students and Perkins et al. (2002) used PAL to deliver resuscitation training to mixed classes of medical, dental, nursing and physiotherapy students.

1.2.6 PAL in Veterinary Education

While the human medical profession in the UK has formally recognised the importance of the development of teaching skills as part of undergraduate training, this has not yet happened within the veterinary profession. The body of literature pertaining to the use of PAL in veterinary medical education is considerably smaller than that relating human medical education but, published evidence relating to its implementation is growing and PAL has been used in some diverse and interesting ways. For example, PAL models have been used in veterinary education for the teaching of pre-clinical anatomy and histology (Plendl et al. 2009, Salomaki et al. 2014) and in a clinical context for the teaching of bovine rectal palpation skills (Baillie et al. 2009) and communication skills training (Strand et al. 2013). A recently described novel adaption of PAL approaches in veterinary education is a pastoral-based student support programme where trained peer support tutors are available to provide help, support and guidance to veterinary students cover all aspects of university undergraduate life (Spielman et al. 2015). An article by Bell et al. 2016, which provides guidance on how to introduce PAL into an undergraduate veterinary curriculum based on the authors' experience of running PAL interventions at the R(D)SVS over a number of years, has also been accepted by the Journal of Veterinary Medical Education and is awaiting publication.

1.2.7 Reasons for using PAL

Create a more positive and effective teaching environment

A key objective of any teaching intervention is to create a safe, stimulating and positive learning environment in which tutees can improve and develop their academic skills and knowledge in the subject area covered in the session. There is an increasing understanding of the importance of creating a less threatening and more positive teaching atmosphere, to optimise the learning environment for undergraduates enrolled on demanding courses such as human and veterinary medicine (Ten Cate & Durning 2007). These courses are particularly challenging because of the constant change and advancement in academic knowledge and the additional pressure of the requirement to learn and develop professional skills. These factors combined with the ambitious learning expectations of students accepted onto these courses, can often result in the development of anxiety, stress and exhaustion in these student populations (Salomaki et al. 2014). A justification for using PAL in relation to this is that the informality that junior student tutees often feel towards their more senior tutor colleagues can create a more relaxed, positive educational environment, where they feel safer and more comfortable practising their skills and also more willing to raise concerns regarding lack of knowledge or understanding, without exposing themselves to ridicule or the risk of feeling foolish (Wadoodi & Crosby. 2002, Baillie et al. 2009, Ten Cate & Durning. 2007, Hill et al. 2010). It has also been suggested that creating a more relaxed, positive environment through student-led group work, deepens the engagement of the students with the learning task at hand, thereby increasing their intrinsic motivation to learn and encouraging a more in-depth understanding of the subject matter (Salomaki et al. 2014).

An argument often used to explain why students are more engaged and motivated to learn by teaching sessions led by their peers is the cognitive congruence hypothesis which states that ‘a teacher with a knowledge base similar (i.e. congruent) to the learner’s is a more effective teacher than an expert in the field who has a dissimilar knowledge base i.e. who is cognitively incongruent, or who has a large cognitive distance’ (Ten Cate & Durning 2007). The theory behind this concept is that peers, who have a more similar knowledge to the learners, may have a better understanding and visualisation of the problems and difficulties that the students are facing compared to experts and may therefore be in a better position to explain difficult concepts at a more appropriate level. PAL therefore provides the ideal platform to explore and exploit any benefits associated with this concept. Evidence to support this exists in a randomised controlled study by Perkins et al. 2002 of peer-led resuscitation training for healthcare students, which showed that students taught by peers, who had attended a formal training course and passed an examination in the subject, were significantly more likely to be successful in the practical test held at the end of the PAL intervention than those students taught by clinical staff (Perkins et al. 2002).

Tutors and tutees benefit academically from the experience

Another established and widely documented reason for implementing PAL is because tutors as well as tutees may gain academically from the experience and some studies have suggested that tutors gain more from the interventions than tutees (Topping 1996, Buckley & Zamora 2007, Ross & Cameron 2007). An explanation for this is summarised by the well-known phrase associated with the French moralist and essayist Joseph Joubert, who is purported to have said 'to teach is to learn twice' (Topping 1996, Ross & Cameron 2007). More in-depth investigations into this observation suggest the reason that student tutors may benefit academically from teaching is because the process of preparing to teach requires the individual to review their skills and knowledge relating to the subject matter and motivates them to engage more with the subject and identify and address areas of weakness. In addition, the act of tutoring, involving the presentation and vocalisation of information and responses to tutee questions, requires simplification and clarification of the subject matter, providing a further cognitive challenge. This challenge encourages student tutors to transform and reorganise their existing knowledge of the subject matter through the integration of new information and the subsequent formation of new associations. The teaching process in its entirety therefore consolidates and strengthens the student tutors knowledge and understanding of the subject matter covered during the intervention (Topping 1996, Ross & Cameron 2007, Ten Cate & Durning 2007, Baillie et al. 2009, Salomaki et al 2014).

While there is a common perception that PAL can improve academic performance, analysis of studies that have investigated whether PAL can objectively enhance student academic performance have produced mixed results, with a balance in the body of evidence supporting improvements in student performance with reports suggesting that there is no measureable improvement. (Williams & Reddy 2016).

Studies that have reported a positive effect on student examination performance following PAL interventions suggest that it is student tutors who benefit most. Perry et al (2010) found that following a PAL intervention focusing on musculoskeletal examination skills involving a cohort of 50 final year medical students as tutors and 159 tutees, 100% of the student tutors passed the final year exam compared to 87% of the student tutees ($p<0.01$). Peets et al. (2009) in an analysis of a PAL study involving 135 first year medical students focusing on gastroenterology and haematology found that following clinical presentations student tutors achieved 80.7% in the end of course MCQ exam compared to 77.6% for tutees ($p<0.01$). Knobe et al (2010) following a PAL intervention using a cohort of nine student tutors to teach musculoskeletal ultrasound examination skills to 75 student tutees, found that the tutors performed significantly better than the tutees in both the end of course MCQ ($p=0.02$) and OSCE ($p<0.001$) exams. An important caveat which must be taken into consideration when assess these results is that in some of these studies, notably Knobe and Perry, the student tutors were volunteers and it has been suggested that students who volunteer for these roles

are academically stronger and more confident in their abilities which may have an effect on these results (Iwata et al. 2014).

With regard to PAL having a positive effect on student tutee performance, Blank et al (2013) in an analysis of a PAL intervention focussing on clinical examination, involving a cohort of 84 third year medical students, found that the control group not involved in the PAL intervention achieved a median score of 57% in the final OSCE compared to 77% achieved by those who took part in the PAL sessions ($p<0.001$). Perkins et al (2002) in a study investigating a PAL intervention involving the teaching of basic lifesaving examination skills to dental, nursing, physiotherapy and medical students by near peers, found that those taught by their peers performed better in the end of year OSCE exam (56/57 pass rate) compared to those taught by staff members (53/62 pass rate, $p<0.05$) but there was no significant difference between the two groups in the MCQ theory exam. These findings therefore suggest that PAL may be a more effective tool for the teaching of practical skills rather than theoretical learning (Williams & Reddy 2016).

While there is evidence to suggest that PAL has a positive effect on student performance, studies have also shown no significant improvement and in some cases there has been a decline in student performance. Brannagan et al (2013) for example, in a study involving a cohort of 179 first year nursing student tutees and 51 third year tutors, comparing the knowledge of nursing students who had taken part in a PAL intervention on post-operative wound care with students who had received staff-led teaching, found that there was no significant difference in the results of post intervention knowledge tests between the two groups of tutees. Similarly, Weyrich et al (2009) conducting a study investigating whether PAL is as effective as faculty-led training for the teaching of internal medicine skills to a cohort of 89 student tutees, found that in the post intervention OSCE examination there was no significant difference in performance between the PAL and faculty-led groups. On a positive note however, this outcome suggests that PAL can be as effective as faculty-led training as a teaching tool.

The results of studies conducted by Knobe et al (2012) and Walsh et al (2011) suggested that PAL could have a negative impact on student performance. Knobe et al (2012) in a study involving a cohort of 304 medical students, focusing on the use of PAL to teach spinal manipulation skills, reported that the mean OSCE result for male students was 4.0 for the staff-led group compared to 3.4 for the PAL group ($p<0.001$) and 4.4 for staff-led female students compared to 3.7 for the PAL group ($p<0.001$). The study by Walsh et al (2011) compared the effectiveness of teaching aseptic urinary catheter placement to a cohort of 60 medical and nursing students delivered by experts to that delivered by peers. The study found that the expert-led group performed significantly better in the final examination than the PAL-led group ($p<0.05$).

The results of these studies therefore show that while there is evidence to suggest that PAL can have a positive effect on student performance, multiple studies have also shown that PAL may have no effect

and in certain cases could have a negative impact on students who have experienced an intervention. (Williams & Reddy 2016).

Positive social interaction

The social interaction that occurs between student tutors and tutees during a PAL intervention has been suggested as another important reason why this methodology can be an effective teaching tool (Topping 1996, Ten Cate & Durning 2007). Peer to peer contact gives students the opportunity to discuss difficulties and challenges they are encountering on their academic course, or with university life in more general terms, with individuals who have more interest in their extra-curricular activities and to whom they can more closely relate. More senior peer tutors may also have a better understanding of certain issues than faculty staff (Topping 1996, Baillie et al. 2009, Strand et al. 2013). This interaction between students at different levels within a course also allows positive mentoring relationships to develop (Kam et al. 2013). Peer to peer counselling has also been described as being beneficial to the student counsellor as well as the student being counselled through the 'helper theory principle' which states that students help themselves by helping others (Ten Cate & Durning 2007, Spielman et al. 2015).

Better and more efficient use of faculty staff and resources

A recurring theme given as a major reason for considering the implementation of PAL is the constant pressure on curriculum organisers to maintain and improve teaching quality while at the same time coping with increasing student numbers and limited or decreasing resources (Topping 1996, Nestel & Kidd 2005, Ten Cate & Durning 2007, Baillie et al. 2009). A potentially negative impact of increasing student numbers, coupled with limited resources, is larger class sizes, which by default, encourages a reversion to traditional lecture style teaching methods and a move away from small group and tutorial teaching sessions. This in turn results in less interactive teaching and learning for students on an individual basis (Topping 1996). PAL has been shown to be an adequate substitute for faculty led education, thereby providing a solution to this growing issue, without compromising student learning (Perkins et al. 2002, Ten Cate & Durning 2007, Burke et al. 2007, Peets et al. 2009). A good illustration of where a PAL intervention has been used successfully to tackle such an issue is given in a paper by Baillie *et al.* (2009) entitled 'Introducing peer-assisted learning into a veterinary curriculum: a trial with a simulator'. At the Royal Veterinary College, University of London, a Haptic Cow simulator is used to teach bovine rectal palpation skills to third year veterinary undergraduate students, prior to practicing their skills on live animals. As the simulator training requires one-to-one tuition, increasing student numbers meant that there were issues with providing enough tutors, finding space within the timetable to organise the practical sessions and ensuring adequate supervision. One

solution used to solve these issues was a PAL intervention where a group of volunteers from the third year cohort were trained how to use the simulator by teaching fellow tutors. These student tutors then went on to train third year tutees taken from their own cohort on a one-to-one basis. A staff member observed each tutor for one or more teaching sessions as a form of quality control. This PAL intervention therefore used limited staff resources efficiently and effectively to increase student access to a limited resource, which in turn enabled a large cohort of students to practice and improve a clinical skill. Nestel & Kidd in their 2005 paper describing the use of PAL in the teaching of patient-centred interviewing techniques, noted that although there considerable efficiency savings with regards to staff resources, there was a considerable investment of staff time in organising the programme and the savings mainly related to a reduction in the number of faculty required during the teaching process (Nestel & Kidd 2005).

Historically, PAL interventions have been implemented as a solution to resource limitations associated with financial issues and difficulties with staff recruitment (Ross & Cameron 2007). In more recent times however, it has become widely accepted that replacing staff with students in an attempt to resolve these issues is difficult to defend from an ethical viewpoint and any benefit should only be considered after assurances have be put in place that implementing PAL will not result in any reduction in teaching quality or disadvantage student tutors or tutees in any way (Ross & Cameron 2007). When PAL is implemented properly however, important positive knock on effects can included more efficient use of staff time and resources, which in turn can lead to financial savings (Topping 1996, Strand et al. 2013).

Drive by institutions to improve graduate teaching skills and knowledge

A more recent driving force behind the consideration of PAL as a teaching methodology in human medicine, is external and political pressure on educational establishments to improve graduate teaching skills and prepare doctors for their future role as educators (Ten Cate & Durning 2007). This external pressure was highlighted in the UK by The General Medical Council (GMC) who stated in ‘Tomorrows Doctors’ that medical graduates must ‘be able to demonstrate appropriate teaching skills’ and by the Liaison Committee on Medical Education (LCME) and the Accreditation Council for Graduate Medical Education (ACGME) in the USA, who are the major accrediting bodies that oversee medical student and resident training, who stated that teaching is a necessary skill that medical trainees must develop (GMC 2003, LCME 2015, ACGME 2013). An often-cited benefit of PAL in relation to this is the practice and development of a range of different teaching and professional skills that comes with participation in cooperative learning (Baillie et al. 2009, Salomaki et al. 2014). Student tutors for example develop, improve and demonstrate organisational and teaching skills by going through the process of preparing and delivering a teaching session (Wadoodi & Crosby 2002, Dandavino et al. 2007, Ten Cate & Durning 2007).

While the importance of developing teaching skills in undergraduates has been formally recognised by the human medical profession, this is not yet the case with the veterinary profession. The obvious focus of any veterinary consultation is the animal patient. Success however, with regards to preventative healthcare or treatment of underlying disease, requires the close co-operation of the human owner. Strong teaching and communication skills are therefore as important to a veterinarian as they are to a human medic because the vet needs to be able to teach and educate owners to ensure that the health and welfare of the animal in their care is maintained.

One of the most widely reported reliable benefits of PAL is an improvement in communication skills, which for healthcare professionals is a core skill as they need to be able to communicate effectively with staff and clients on a daily basis (Strand et al. 2013). Baillie et al. (2009), in their study of using PAL to deliver training on the Haptic Cow simulator, for example found that volunteer tutors did not consider the development of communication skills as a major reason for volunteering but this was reported as a major benefit of the intervention when tutors were surveyed at the end of the project. A study by Mellanby et al. (2011) entitled 'Perceptions of clients and veterinarians on what attributes constitute a 'good vet'', used a questionnaire survey to investigate how important small animal (SA) veterinarians and SA clients considered twenty attributes for a veterinary surgeon to have using a five point scale ranging from 'very important' to 'not at all important'. To further the investigation, respondents were also asked to list their top three attributes from the list of twenty. A significantly larger proportion of clients included 'knowledge about veterinary medicine and surgery' and 'good with animals' in their top three compared to SA vets. Within the list of twenty questions interpersonal attributes and personality traits such as 'ability to work as a team', 'politeness', 'honesty' and 'patients' scored highly among SA clients. The only attribute that a greater percentage of SA vets than SA clients considered to be 'very important' was 'good communication skills'. This contrast was emphasised further by result that 72% of SA vets included 'good communication skills' in their top three attributes compared to 16% of SA clients. These findings therefore suggest that SA vets and the institutions that educated them may have overestimated the importance of good communication skills.

Asking students to deliver a PAL session also gives them greater ownership of the learning process and responsibility for teaching others, which in turn encourages a greater individual commitment to learning and also may enhance their self-esteem and self-confidence (Topping 1996, Salomaki et al. 2014). Working together as a small group to deliver a PAL intervention also encourages team building and mutual respect with colleagues and provides an opportunity to practise and develop skills required to form effective professional working relationships (Nestel & Kidd 2005, Baillie et al. 2009, Mellanby et al. 2011). The inclusion of PAL interventions into undergraduate courses can therefore give medical and veterinary undergraduates a valuable opportunity to practice and develop a range of teaching and more generic professional skills that are essential for their future roles as clinicians and educators (Ross & Cameron 2007, Salomaki et al. 2014).

Encourage recruitment into and careers in clinical academic medicine

An ongoing concern for the medical profession in all parts of the world is the recruitment of clinical academics. In the UK for example in 2013 this sector accounted for only 6% of the workforce and the numbers were declining. Reasons given for this decline have been attributed to uncertain and unattractive career pathways (Lawson McLean et al. 2013). An often-cited key benefit of PAL in the literature is the popularity and enthusiasm that students have for it as a teaching methodology (Wadoodi & Crosby 2002, Sengupta et al. 2007, Baillie et al. 2009). By successfully delivering a teaching session, student tutors can feel a sense of satisfaction by both improving their own understanding of the topic covered and by helping junior students learn and develop (Wadoodi & Crosby 2002). A Key advantage of PAL therefore is that it can introduce, enhance and reinforce positive attitudes towards teaching, which may encourage the individual to pursue further teacher training or consider teaching or academia as a major part of their future career (Buckley & Zamora 2007). The introduction of PAL into undergraduate medical curricula may therefore play a part in reversing this decline in recruitment by demonstrating to students the reward and satisfaction that can come from pursuing a career in clinical academic medicine.

1.2.8 Limitations of PAL as a Teaching Methodology

In addition to a range of benefits and reasons for using PAL, there are limitations that need to be recognised and addressed when considering introducing this teaching methodology to a curriculum. A common concern is the potential for limitations or gaps in the knowledge of student tutors that could lead to an inability to answer certain questions or the provision of incorrect information (Baillie et al. 2009, Hill et al. 2010, Salomaki et al. 2014). Another key concern often raised is that the quality of teaching provided by student tutors could be inferior to that provided by faculty staff (Salomaki et al. 2014). In most cases however, studies which directly compare staff and student teaching by objective assessment of the outcome for tutees, suggest that there is no difference in teaching quality (Ross & Cameron 2007) and there is evidence to suggest that the teaching delivered by students can actually be superior in certain scenarios to that given by staff members (Perkins et al. 2002).

The execution of a PAL intervention, in many cases, may be the first time that a student tutor has had to use the skills and knowledge required to deliver an effective teaching session. For certain individuals, especially those who have a negative attitude towards group work, this could create a challenging and stressful situation, which in turn could have a negative impact on their development, especially in situations where participation is compulsory (Salomaki et al. 2014). Another factor raised in the literature, which could limit the effectiveness of PAL, is that in certain situations, tutors could be teaching tutees possessing more knowledge or experience of the subject area being taught.

This could lead to a situation where tutors feel awkward judging the tutees, potentially creating a negative atmosphere (Baillie et al. 2009, Salomaki et al. 2014).

1.2.9 Designing a PAL Course

It has been widely reported that successful execution of PAL requires good planning and course design, clear objectives for the teaching session and subject areas to be covered, and suitable training of peer tutors prior to the intervention. (Wadoodi & Crosby 2002, Nestel & Kidd 2005, Baillie et al. 2009). Successful implementation of PAL within a curriculum also relies on careful evaluation of the strengths and weakness of individual courses to ensure that the intervention provides optimum benefit to both the students and the institution (Wadoodi & Crosby 2002, Baillie et al. 2009). The importance of good planning and design is highlighted by the fact that several detailed papers specifically focusing on these topics have been published (Wadoodi & Crosby 2002, Ross & Cameron 2007, Olaussen et al 2016).

While good support of tutors by staff is considered essential (Baillie et al. 2009), student-centred design and implementation of PAL has been shown to exhibit trust in the student body by faculty, encourage and nurture initiative amongst the students involved, maximise the potential for free expression of both tutors and tutees during the intervention and create an informal but highly interactive learning environment (Wadoodi & Crosby 2002). While it is important therefore to give students the lead, it is also widely accepted that, like other formal learning interventions, organisational issues heavily influence the success of PAL and as such, both tutor training sessions and the actual intervention itself should be formally timetabled into the curriculum (Topping 1996, Wadoodi & Crosby 2002, Nestel & Kidd 2005). For example, Nestel and Kidd in their 2005 paper describing the use of PAL in patient-centred interviewing reported that the most common reason given by tutors for not participating in teaching sessions was conflicting schedules. The timing of the introduction of PAL and tutor training to an undergraduate course could also be an important consideration because, if introduced in the early years, it would enable students to use and develop their skills as they progress in a more formal context, through specific PAL projects but also informally when working with student colleagues as part of group exercises (Baillie et al. 2009). Careful introduction of PAL early into a veterinary curriculum could therefore optimise the benefits of this teaching methodology for both students and the institution alike.

1.2.10 Tutor Selection

Tutor selection for PAL interventions is a widely debated topic across the literature. Traditionally, it was assumed that the best students should deliver PAL interventions and therefore tutors were

selected based on academic performance (Topping 1996). A more modern and widely accepted view however, is that PAL interventions should be mutually beneficial for both tutors and tutees and therefore very large differentials in ability between tutors and tutees should be view with caution as this can prove under-stimulating for the tutor (Topping 1996, Wadoodi & Crosby 2002). In addition, academically-gifted students may not have encountered the issues that weaker students experience and therefore weaker students in the tutor role, who have successfully negotiated these experiences, may be in a stronger position to identify and address the concerns of junior students (Wadoodi & Crosby 2002). Academic selection of tutors also means by default that weaker students, who would often benefit most from an intervention, may be excluded (Wadoodi & Crosby 2002, Buckley & Zamora 2007).

There is also ongoing discussion with regard to whether tutor selection should be voluntary or compulsory. Advantages of voluntary selection include academic inclusivity, so students of all abilities can benefit and tutor motivation, which is nurtured by a voluntary process and has been shown to be an important factor in the success of the learning experience (Wadoodi & Crosby 2002). Buckley and Zamora in their 2007 paper investigating a peer-tutoring programme in clinical examination skills where tutor participation was voluntary, found that there was a bias towards higher achieving students in the tutor cohorts and so there is a risk that less able students, who often gain most from participation in these interventions, may be disadvantaged if there is no additional encouragement for them to participate (Buckley & Zamora 2007). Another potential disadvantage of a voluntary system is insufficient participation. A paper by Wadoodi and Crosby 2002 however reported that a voluntary programme attracted over 50% response, which was the maximum that could be accommodated (Wadoodi & Crosby 2002).

Traditionally in medical schools in the USA, PAL interventions were designed with a one tutor to one tutee ratio, with a ‘cross-year’ or ‘near’ peer relationship, with the tutor in a higher academic year than the tutee (Wadoodi & Crosby 2002, Baillie et al. 2009). This intensive model is viable at an undergraduate level and a good way of improving student interaction between academic years, but a limitation is that success is heavily dependent on the individual pairing (Wadoodi & Crosby 2002). Baillie et al. (2009) in their paper entitled ‘Introducing peer-assisted learning into a veterinary curriculum: a trial with a simulator’ reported using a ‘true’ peer system where tutors and tutees were taken from the same third year cohort. The reason given for choosing this system was that it was easier to organise times when the tutor and tutee can get together because they were on the same timetable. A disadvantage of using a ‘true’ peer system is that a greater level of familiarity and informality between tutor and tutee could lead to a lack of direction during the teaching session (Wadoodi & Crosby 2002).

A key potential issue with a one-to-one tutor to tutee ratio is that limitations or gaps in the tutor’s knowledge could lead to an inability to answer certain questions or the provision of incorrect

information. A way to overcome or avoid this situation is to design an intervention where the session is led by a small group of tutors or, if individual tutors are used, a rotation system through the tutee groups is implemented. Designing the intervention in this way exposes the tutees to a greater expanse of knowledge thereby compensating for any lack of knowledge that individual tutors may have (Wadoodi & Crosby 2002). It is also important when designing an intervention to include an academic honesty policy where tutors accept that they may not know everything and admit this to tutees when asked unfamiliar questions (Wadoodi & Crosby 2002).

1.2.11 UCVME Literature Review

The general acceptance amongst the medical profession that teaching students is an essential part of a junior doctor's job description has been formally recognised in the UK by the General Medical Council (GMC), who have stated that an ability to teach is an essential graduate attribute of medical students and internationally by the LCME and ACGME in the US and CanMEDS in Canada (Erlich & Shaughnessy 2014). Despite this formal recognition, students have reported that there is wide variation in the quality of teaching given by junior doctors and that the teaching provided is often ineffective (Erlich & Shaughnessy 2014). This is key to undergraduate education because studies in the US have shown that good teaching can improve student performance in the United States Medical Licensing Examination (USMLE) scores and poor teaching can actually lower student marks (Erlich & Shaughnessy 2014). Junior doctors also often report that they feel uncomfortable teaching undergraduate students (Erlich & Shaughnessy 2014). Therefore this evidence, combined with an international obligation to provide teaching training for medical students, supports the view that future doctors should be given formal instruction in how to teach so that they can play a competent and effective role in the education of future students following graduation (Erlich & Shaughnessy 2014). In addition to improving the quality of teaching delivered by junior doctors, the provision of teaching instruction to medical students may also improve their learning ability, by providing them with a more in depth understanding of teaching and learning. The development of communication skills through this process may also improve doctor-patient interaction where teaching and education play an essential role in the development of this relationship (Dandavino et al. 2007).

While the body of literature describing and evaluating the teaching of medical and veterinary medical students by their peers is growing, current evidence of medical schools providing formal education in teaching in medical undergraduate curricula is limited (Dandavino et al. 2007, Erlich & Shaughnessy 2014). A survey by Soriano et al. conducted in 2008 and reported in 2010, investigating students-as-teachers (SAT) programmes in US medical schools, found that of the ninety-nine schools out of 130 who responded, all used students as teachers in some capacity in their undergraduate courses but only 44% offer formal programmes designed to train students to teach effectively. In the UK it has been reported that only one out of twenty nine medical schools in the UK have formal teacher training components incorporated into their undergraduate programmes (Erlich & Shaughnessy 2014).

A variety of models have been developed by medical schools for teacher training of undergraduates. Some schools have taken a theoretical approach by running sessions covering the core principles of teaching such as presentation and communication skills, teaching methods, establishing goals and objectives and evaluation and feedback, while others have taken a more practical approach by giving senior students the opportunity to practice and experience teaching through the formal inclusion of PAL programmes in the curricula of junior students covering a wide range of topics (Erlich & Shaughnessy 2014).

In general the majority of these teacher training programmes only last for one or a few days, but it has been suggested that the most effective models for teaching undergraduates to teach should be designed to include a combination of both theoretical and practical elements and students should experience multiple teaching sessions over a period of time in order to build their teaching competence (Erlich & Shaughnessy 2014). While the majority of these medical teacher training programmes are short, there are a few examples of more in-depth courses described in the literature that are run over a longer period of time. The University of Sydney for example run a teaching training programme for their undergraduate medical students, consisting of four modules run as two sessions over two afternoons. The modules covered skills teaching, small group teaching, clinical teaching and assessment and feedback (van Diggele et al. 2015). Smith et al 2007 described a week long retreat for medical students in the USA entitled 'Training Tomorrow's Teachers Today', designed to introduce delegates to clinical teaching and leadership. In the first two years 23 students from 17 medical schools completed the programme. A six week formal elective in medical education integrated into the 6th year of the medical undergraduate programme at the University of Adelaide has also been described, with the aim of giving students the opportunity to develop generic and transferable teaching, facilitation and assessment skills (Nelson et al 2013). Mayo Medical School in the USA offers a teaching assistant training programme each year to six third year medical students run over a seven week period alongside the Human Structure (anatomy) course. The students have an opportunity to work as teaching assistants learning teaching and educational research skills (Lachman et al 2013). The University of Ulm offer a 'Train the Tutor' programme for students on the gross anatomy course, with the objective of preparing student tutors for PAL courses run as part of the clinical studies section later in the undergraduate programme (Horneffer et al 2016). The course consists of a two-day preparatory workshop, practical teaching experience gained over a two-month period and recorded in a teaching log and a final didactic one-day workshop at the end that focuses on student preparation for the PAL courses. The longest and most comprehensive programme described in the current literature is the BMSc Teaching in Medicine Intercalated Degree Programme offer by the University of Dundee to all medical undergraduates who have complete the third year of their course. The programme is run over an academic year and consists of two parts, the first part comprising of six modules focusing on basic research methods and the nature of education, with the second part including a supervised educational project and teaching experiences. 13 self-selected

students had successfully completed the programme over the four-year period between its introduction in 2010 and 2014 (Muir & Law 2014).

1.2.12 Gaps in the literature that this research aimed to address

As described previously, while the body of evidence pertaining to the use of PAL in veterinary medicine is growing, it is still considerably smaller than that published for human medicine. PAL has been used at the R(D)SVS as a teaching methodology for the undergraduate veterinary medicine degree programme for a number of years and a considerable amount of qualitative feedback data from the Canine and Equine PAL clinical examination classes has been accumulated. A key motivation behind this project was to add to the small but growing body of evidence relating to the use of PAL in veterinary medicine through the analysis of the feedback data from these PAL classes. While analysis of qualitative data is useful and informative, the reputation of any teaching methodology relies on robust evidence that there is a positive correlation between experiencing an intervention and academic performance. Analysis of the research shows that while quantitative studies have been described, most of the published evidence relating to PAL focuses on qualitative data. The MCQ study in this project was therefore designed and implement in an effort to complement the qualitative feedback data collated from the equine and canine clinical examination skills PAL intervention by making a quantitative assessment of the PAL experience through the measurement of any improvement in the knowledge required by students to perform an effective canine clinical examination following the PAL intervention. This study would also add to the body of evidence focussing on quantitatively assessing the benefits of PAL.

The extensive use of PAL across the veterinary undergraduate curriculum at the R(D)SVS over a number of years, demonstrates the commitment of the institution to PAL as a teaching methodology and confidence in its ability to enhance the learning of undergraduate students. In line with the medical profession in the UK, the R(D)SVS also recognises the advantages of strong teaching skills in veterinary graduates and wanted to demonstrate this by formally acknowledging the development of these skills by its veterinary undergraduates. The UCVME described in this study was therefore developed to try and fulfil this need and, to the author's knowledge, is the first and only formal veterinary undergraduate teacher-training programme currently in existence. A key aim of the UCVME is to demonstrate to the veterinary profession the need for the development of strong teaching skills in veterinary undergraduates and ultimately, like the medical profession, achieve formal recognition.

1.2.13 The Ontological, Epistemological and Methodological Approach of this Study

Analysis of the current literature shows that the body of research using the thoughts and opinions of individuals who have experienced an intervention to explore the effectiveness of PAL as a teaching methodology, is considerably greater than that which describes a more positivist approach, where the aim of the research is to identify a more certain, accurate and unambiguous benefit of experiencing a PAL intervention, by attempting to measure a clear improvement in academic performance, for example. Analysing the effectiveness of a PAL intervention is a very complex process because, although the individuals involved often have commonality with regard to the subject matter they are studying and academic goals, there will be variation in terms of background, existing skills and experience and learning styles among those involved. Some will also take on the role of tutor while others will be tutees. This therefore means that there will be a range of perspectives and opinions as to whether the intervention was effective or not. Taking this variability into account, the theoretical perspective of any methodology used to investigate the effectiveness of PAL must fit a more post-positivist model where the perspective is less absolute and probability is more relevant than certainty (Illing 2010).

Due to the wide range of opinions and perspectives that will be formed by individuals that experience a PAL intervention, the ontological position in this instance, which is associated with the nature of existence and the structure of reality, will be associated with multiple realities because there will be a range of views and opinions among the individuals who have taken part in the process. Due to this range of realities the epistemological position, which is associated with the theory and limits of knowledge and informs the research methods chosen for a study, will be post-positivist because, due to the complexity associated with studying a PAL intervention, no matter how much rigor is applied to the scientific method, the research outcomes can never be totally objective or certain.

The aim of this study was to analyse a large and complex body of data extracted from feedback questionnaires that detailed the thoughts and opinions of tutors and tutees who had experienced a PAL intervention. Based on the information discussed above, the ontological, epistemological and methodological approach taken was aligned to a post-positivist theoretical perspective. An attempt to introduce a more objective, positivist element to the study was implemented through the inclusion of the MCQ study.

As the body of research relating to PAL grows and the knowledge and expertise relating to analysing the effectiveness of interventions develops, recurring variables will be identified and accounted for, enabling clearer structure to be applied to research projects so that more defined comparisons can be made to explore the effectiveness of PAL as a teaching methodology with more accuracy.

Chapter 2: Evaluation of the Canine and Equine Clinical Examination Skills PAL Interventions

2.1 Methodology

2.1.1 PAL Plenary Briefing

Prior to the Canine Clinical Examination Skills PAL sessions, the 4th year tutors attended a two and a half hour introductory training session run by R(D)SVS staff members, in the design and delivery of PAL teaching interventions. The session began with a discussion of examples of instances when veterinary undergraduates and qualified veterinary surgeons take on the role of educators, to illustrate the value of good teaching and learning skills to the career of a veterinary professional. They were then taught about different learning styles; visual, auditory and kinaesthetic and asked to assess what they thought their dominant learning style was. The aim of this exercise was to encourage them to consider the implications involved in the design of a learning activity and what they needed to take into account when designing their PAL sessions. It also illustrated the importance of making their teaching as engaging and stimulating as possible for tutee groups that could be composed of individuals with different learning styles.

The next phase in the introductory session focused on defining PAL through the introduction of the teaching methodology and a discussion of the benefits of this form of intervention to both tutors and tutees. Following this introduction, the 4th year students were then set the task of assuming the role of tutor and 'designing and delivering a PAL class for 1st year/GEP clinical skills training in the BVM&S curriculum'. In order to help the students achieve this, they were given an overview of the 1st year/GEP clinical skills course learning objectives and content and logistical information including the location and time available for the session, the size of the tutee groups they would be teaching and the resources available to them. The basic resources made available included a live dog, a consult room table, a stethoscope and access to weighing scales. Additional teaching materials were available on request.

Following this introduction to PAL and the task required of them, the 4th years were divided alphabetically into small groups of three to five individuals and given thirty minutes to start planning their teaching session. During this time, students were asked to discuss specific learning objectives and provided with a lesson template proforma (Appendix A1) to both help them structure and detail their intervention and encourage documentation, which they could then refer to on the day to help them deliver the class effectively and submit after the session for assessment and feedback.

After spending time in their small groups discussing initial ideas for their PAL teaching sessions, the cohort reconvened for further instruction on planning a teaching session, where the importance of planning was discussed and the three key stages of setting the scene, the body of the class and closing the class were introduced. Each of these key stages were then broken down and discussed in more detail. The training session ended with a discussion on questioning which outlined the reasons for asking questions, the appropriate use of open and closed questions and how to ask questions effectively to keep the audience engaged. The students were also instructed on how to respond to questions that they didn't know the answer too.

To close the session, a brief summary was given to recap on what was expected from the students and what they needed to do if they required help before or during the teaching session. Examples of feedback given by previous 4th year and 1st year/GEP cohorts who had experienced this process and various issues raised by them were also given to the students to help them prepare for their teaching sessions and illustrate the relevance and provide motivation for the task ahead. Finally the students were told about a PAL roundup session that would take place after the teaching sessions to provide the opportunity to give feedback and reflection in the PAL lesson plans, discuss common issues that arose during the classes and give the opportunity to ask general questions about the PAL classes and 'vets as educators'.

2.1.2 The Equine and Canine Clinical Examination PAL Classes

The equine PAL classes were held in February of each year using the research horses kept in the stables at the R(D)SVS Equine Hospital. A key difference between the equine and canine classes was that participation as tutors in the canine classes was compulsory for the 4th year students whereas involvement in the equine classes was on a voluntary basis. An introductory briefing session was held at the start of the classes with all the tutors and tutees present to explain how the classes would run and then the tutors and tutees were divided into small groups and allocated to one of a number of teaching stations that had been set up in the stables. The teaching sessions were then conducting in a very similar manner to the canine clinical examination sessions described below.

The canine clinical examination PAL teaching sessions were held over a six day period in May of each year in the Clinical Skills Classroom in the R(D)SVS Teaching Building. The room was divided into three stations using solid dividers to create discrete consultation 'rooms' leaving a large seating area in the centre of the main room where the tutees congregated at the start of each session. Weighing scales were also provided in the corner of the room and were shared between the stations. Each teaching station contained a basic consultation room table and a stethoscope was provided. A live dog was also allocated to each station at the start of the session and introduced to the 4th year tutor groups when they arrived to set up. Staff consulted a list of addition materials/equipment requested by individual tutor groups prior to the PAL interventions before each session, to make sure that the requested resources were present in the allocated teaching station when the 4th year tutors arrived to set up.

Each day was divided into four teaching sessions of ninety minutes duration, two in the morning; 10.00am to 11.30am and 11.30am to 1.00pm and two in the afternoon; 2.00pm to 3.30pm and 3.30pm to 17.00pm (Appendix B4). Each ninety minute session consisted of a one hour block for the PAL intervention and two fifteen minute periods, one held before the teaching time and one after. During the pre-teaching period the 4th year tutors set up and prepared their stations and the 1st year/GEP tutees registered and were given a short preparatory introduction. The post-teaching period allowed time for the 4th year tutors to tidy up and the 1st year/GEP tutees an opportunity to complete a feedback form. These periods also provided the tutors and tutees with the opportunity to complete the multiple choice questionnaires for the knowledge assessment study that was run in parallel with the Canine Clinical Skills PAL classes in 2015.

In preparation for the PAL interventions, the 4th year tutor cohort was divided alphabetically into thirty-six small groups of three to five individuals during the PAL Plenary Briefing. Three small groups attended each one and a half hour PAL teaching session, with each individual group allocated to a teaching station. The 1st year tutee cohort was divided alphabetically into four quarter cohorts A, B, C and D and then further subdivided into twenty four small groups consisting of four to six students. Three small groups attended each one and a half hour PAL teaching session, with each individual group allocated to a teaching station. Similarly to the 1st year tutee cohort, the GEP tutees were also divided alphabetically into four equal quarters. Each GEP quarter cohort was then allocated to a one and a half hour PAL teaching session, with each cohort divided into three equally sized groups of three to four students during the fifteen minute introductory session before the teaching started.

At the end of the teaching session, the tutees were asked to reconvene at the seating area in the centre of the room and were given a feedback questionnaire to complete (Appendix A2). The questionnaire was composed in the main of five point Likert scale responses to statements with some open ended questions included to enable the students to expand on their Likert responses. While this feedback was anonymous, an optional section was included at the end giving the students the opportunity to included demographic information to allow for more in depth analysis of the dataset.

In addition to tidying their teaching stations, the 4th year tutors also took this opportunity at the end of the session to complete the 'Group Reflection' section included at the end of the PAL Lesson Template (Appendix A1).

2.1.3 PAL Roundup Session

A roundup session entitled 'The Vet as an Educator' was held for the 4th year tutors approximately a week after the PAL classes to enable them to reflect on what they had experienced during the intervention and to explore how they could build on what they had learned in their future careers. The discussion included examples of feedback given by the 1st year/GEP tutees taken from the post-intervention questionnaires and findings identified by staff following assessment of the tutor's lesson plans. At the end of the session, the staff and student feedback was returned to the 4th year students and they were asked to complete a feedback questionnaire based on Likert scale responses to statements with some open ended questions, similar to that completed by the tutees at then of the PAL interventions (Appendix A4). An optional section was included at the end of the questionnaire giving the students the opportunity to included demographic information to allow for more in depth analysis of the dataset.

2.1.4 The PAL Feedback Questionnaires

The PAL feedback questionnaires were designed by the Canine and Equine Clinical Examination Skills course organisers in 2011 and the same document was used to obtain feedback from tutors and tutees for all cohorts that participated in the interventions between 2011 and 2014. NS attended and assisted with the PAL sessions in 2015 to experience how the sessions were run and the feedback data collated. The Likert scale responses included in the evaluation questionnaires provided six possible responses to the statement: Strongly Agree (SA), Agree (A), Neither Agree or Disagree (N), Disagree (D), Strongly Disagree (SD) and Not Applicable (NA).

1st Year/GEP Tutee Feedback Questionnaire (Appendix A2 and A3)

The first section of the 1st year and GEP feedback form consisted of eight Likert scale responses enabling the collation of qualitative data relating to the tutees perception of how well the tutors designed and delivered the teaching session and whether they thought the intervention had been useful with regard to learning and developing their clinical skills. The next four Likert responses explored the tutees perceptions of being taught by their peers and their opinions with regard to taking on the role of tutor in the future. The final section consisted of open qualitative questions asking for feedback regarding what the tutees found particularly useful, what could be improved, who benefited most from this teaching methodology (tutors, tutees or staff) and their perceived advantages and disadvantages of being taught by fellow students. A non-compulsory section was included at the bottom of the questionnaire to enable collation of basic demographic information.

4th Year Tutor Feedback Questionnaire (Appendix A4)

The 4th year tutor evaluation questionnaire began with six Likert scale responses aimed at those students who had volunteered to lead the equine clinical exam classes, investigating the reasons why they decided to volunteer. There was then a short section of open qualitative questions exploring whether the tutors had attended the equine class briefing session and, if so, whether this had influenced their decision to take part. Those who had not volunteered were then given the opportunity to give reasons why they didn't take part. The next section in the questionnaire focused on the teaching experience, where the students were asked if they had taught before, followed by three Likert response questions asking if they have reservations about teaching, if they would like to teach again and if they felt they were given adequate preparation. The final five Likert scale responses investigate the student's perceptions of how the experience of being a tutor had or had not been of benefit. The final section of the questionnaire consisted of a series of open questions covering what aspects of the classes were particularly useful, if there were any aspects that could be improved and who the tutors thought benefited most from this teaching methodology (tutors, tutees or staff). The tutors were also asked to provide advantages and disadvantages of teaching fellow students followed by a non-compulsory section included at the bottom of the questionnaire, enabling collation of basic demographic information.

2.1.5 Data Analysis of the Feedback Questionnaires

Eight Excel spreadsheets, one for each year of the study for the tutor and tutee cohorts, were created, with columns included for each of the questions asked in the feedback questionnaires. Data from each questionnaire were then inputted manually into the spreadsheets. Codes were created for each of the

Likert response questions, which enabled these questions to be separated from the free text responses in the spreadsheets, using computer-programming techniques. The separated Likert question responses were then converted into an Excel spreadsheet format to which filters could be applied, enabling sectioning of the data for further analysis.

Kruskall-Wallis (KW) Rank Sum Tests were run on the Likert responses from the tutee data sets to investigate whether there was any statistically significant difference between the responses given by 1st year and GEP tutees to each of the questions. KW tests were used in this instance to compare the location/distribution of Likert type responses from the two or more different groups, because this score is of ordinal (ranked) type and hence requires a non-parametric test of location.

To enable analysis of the free text responses, a series of categories were generated for each question based on the type of responses given and an Excel spreadsheet was created. The response given by each individual was then assigned to the category to which it was most closely related by entering a figure 1 into the relevant column in the spreadsheet. A total was then calculated for each category, which could then be compared against the total number of respondents to enable a percentage to be calculated.

2.1.6 Contribution by NS to Canine Clinical Examination Skills PAL Interventions

The contribution by NS to the collection and processing of the data for this part of the study included the creation of the Excel spreadsheets into which the information from the feedback forms was collated, the manual inputting of data into the spreadsheets and the creation of the codes for the Likert response questions, which enable this information to be separated from the free text response for further data analysis. NS also attended the Canine Clinical Examination Skills PAL classes in 2015 to help faculty staff run the classes and gain first-hand experience of how the teaching sessions were organised and managed.

2.2 Results

2.2.1 Introduction

The objective of this part of the study was to use the feedback data from the Canine and Equine Clinical Examination Skills PAL questionnaire completed after the interventions to 'evaluate the use of PAL within the BVM&S curriculum, identify potential benefits to the student learning experience and explore student and perceptions about PAL methodology'. Three hypotheses were formulated to investigate these objectives:

Hypothesis 1 - Veterinary student tutors and tutees are comfortable with the concept of Peer Assisted Learning as a teaching methodology, where 'people from similar social groupings, who are not professional teachers, help each other to learn and learn themselves by teaching' (Topping 1996).

Hypothesis 2: At the point of execution, 4th year tutors are perceived to have the skills required to deliver effective PAL interventions.

Hypothesis 3: It is the perception of PAL tutors that the PAL clinical skills intervention provided a valuable opportunity to enhance their clinical examination and tutoring skills and knowledge.

2.2.2 Descriptive Results

Feedback data included in the Canine Clinical Skills PAL intervention study was collated over a four-year period from 2011 to 2014. PAL was introduced to the veterinary undergraduate curriculum in 2009 with equine PAL interventions run with voluntary 4th year tutors introduced in 2010. A pre-intervention briefing session for 4th year tutors interested in volunteering for the equine PAL classes was introduced in 2012.

The dataset consists of information taken from a total of 1063 questionnaires completed over the four-year period, with 649 responses from 1st year/GEP tutees and 414 from 4th year tutors. An administrative error in 2014 meant that feedback questionnaires were only distributed to approximately half the 4th year tutor cohort in 2014 which accounts for the low number of questionnaires completed by this cohort in 2014, as shown in Table 2.1.

	2011		2012		2013		2014		Total: 2011 to 2014	
	Number	Percentage of Total Cohort	Number	Percentage of Total Cohort	Number	Percentage of Total Cohort	Number	Percentage of Total Cohort	Number	Percentage of Total Number of Students
Total Number of Enrolled Students by Cohort										
1st Year	119	100	125	100	129	100	130	100	503	100
GEP	62	100	68	100	66	100	51	100	247	100
4th Year	148	100	139	100	164	100	161	100	612	100
Total Number of Completed Questionnaires Submitted by Cohort										
1st Year	105	88.2	104	83.2	110	85.3	120	92.3	439	87.3
GEP	56	90.3	58	85.3	51	77.3	45	88.2	210	85.0
4th Year	123	83.1	111	79.9	120	73.2	60	37.3	414	67.6
Total Number of 4th Year Tutor Equine Volunteers	24	16.2	56	40.3	46	28.0	31	19.3	157	25.7
Total Number of 4th Year Tutors Who Didn't Volunteer	99	66.9	55	39.6	74	45.1	29	18.0	257	42.0

Table 2.1 Descriptive Results From Feedback Questionnaires For Equine and Canine Clinical Examination PAL Classes: 2011 to 2014

A table to show the total number of students enrolled on the R(D)SVS undergraduate veterinary programme by cohort for 2011 to 2014 and the number and percentage of total cohort of students who submitted feedback questionnaires following the Equine and Canine Clinical Examination PAL Classes. Figures for the number and percentage of total cohort of 4th year tutors who volunteered for the Equine PAL Classes are also included.

2.2.3 Hypothesis 1: Veterinary student tutors and tutees are comfortable with the concept of Peer Assisted Learning as a teaching methodology, where 'people from similar social groupings, who are not professional teachers, help each other to learn and learn themselves by teaching' (Topping 1996).

The statements from the feedback questionnaires selected to investigate whether the tutors and tutees were comfortable with the concept of PAL, explored any reservations the tutors and tutees had prior to the classes, with regard to being taught by or teaching other students and their opinions as to whether they would like to be involved in PAL interventions in the future. The following text refers to data presented in Tables 2.2, 2.3 and 2.4.

Both tutees and tutors were asked if they had any reservations about being taught by teaching other students. 72% of tutees strongly disagreed or disagreed with this statement with 15.4% indicating that they had no opinion. 12% of tutees strongly agreed or agreed that they did have some reservations about being taught by other students. A Kruskal-Wallis rank sum test used to analyse the tutee data in more depth, returned a P-value of 0.09 indicating that there was no significant difference in the responses given by 1st and GEP tutee groups.

49.6% of 4th year tutor strongly disagreed or disagreed with the statement, with 19.2% having no opinion and 31.2% of tutors strongly agreeing or agreeing that they did have reservations with regard to teaching 1st year/GEP students.

When asked if they would like to be taught again by fellow students, 96.6% of tutees strongly agreed or agreed with this statement. A Kruskal-Wallis rank sum test gave a P-value of 0.27 indicating that there was no significant difference in the responses given by 1st and GEP tutees. In addition, when 1st year/GEP tutees were asked if they would like to teach other veterinary students in the future, 86.4% of respondents strongly agreed or agreed with 11.9% strongly disagreeing or disagreeing.

86.3% of 4th year tutors strongly agreed or agreed that they would like to teach other veterinary students in the future, with 10.8% of respondents having no opinion for or against this statement.

87.1% of 4th year tutors strongly agreed or agreed that being a peer tutor would be helpful for their future veterinary careers, with 11.4% of respondents having no opinion regarding this statement.

When asked to give reasons why they had reservations with regard to taking part in the PAL classes, 38.3% of 4th year tutor respondents cited lack of confidence in their own knowledge as their main reason with 22.0% stating a lack of confidence in their teaching ability.

Table 2.4 shows that when asked “Who do you think benefits most from this method of teaching?”, the largest proportion of 1st year tutees (55.1%) thought that tutees benefitted the most, the largest proportion of GEP tutees (45.5%) thought that tutors and tutees benefitted equally from the experience and the largest proportion of 4th year tutor respondents (35.5%) thought that tutors benefitted the most. 8.7% of 4th year tutor respondents thought that staff benefitted the most while the proportion of 1st year tutees (3.3%) and GEP tutees (3.2%) was smaller in comparison.

Questionnaire Respondent	Feedback Statement	Cohort	Likert Responses: Percentage of Total Respondents					
			SA	A	N	D	SD	NA
Tutee	I had reservations about being taught by 4th year students before the class'	1st Year	2.1	8.4	15.7	39.6	33.5	0.5
		GEP	1.9	13.3	14.8	44.8	24.3	1.0
Tutor	I had reservations about teaching the 1st year/GEP students before the class'	4th Year	2.8	28.4	19.2	35.2	14.4	0.0
Tutee	I would like to be taught again by 4th year students'	1st Year	68.1	27.8	3.6	0.2	0.0	0.0
		GEP	60.0	37.6	1.9	0.5	0.0	0.0
Tutor	I would like to teach other vet students again'	4th Year	29.0	57.3	10.8	2.8	0.3	0.0
Tutee	I would like to teach other vet students in the future'	1st Year	48.3	36.7	12.8	1.6	0.5	0.0
		GEP	42.9	46.2	10	0.5	0.0	0.5
Tutor	Will be helpful for my future veterinary career'	4th Year	24.5	62.6	11.4	1.2	0.2	0.087.

Table 2.2 Likert Scale Responses To Statements From Equine and Canine Clinical Examination PAL Classes: 2011 to 2014

A table to show the Likert scale responses given by tutees and tutors to statements in the Equine and Canine Clinical Examination PAL Classes feedback questionnaires, that referred to reservations about being involved in the classes and opinions regarding being taught by or teaching other students. The data refers to the percentage of total respondents by cohort who Strongly Agreed (SA), Agreed (A) Neither Agreed or Disagreed (N), Disagreed (D) or Strongly Disagreed (SD) with the statement. NA refers to responses where no answer was given.

Response Categories	Cohort						Total	
	2011		2012		2013			
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Lack of confidence in own knowledge	15	25.9	22	59.5	17	37.0	54	38.3
Lack of confidence in teaching ability	12	20.7	8	21.6	11	23.9	31	22.0
Knowledge inferior to tutees	4	6.9	0	0.0	7	15.2	11	7.8
Unsure of tutees knowledge & skill level	8	13.8	1	2.7	1	2.2	10	7.1
Other	19	32.8	6	16.2	10	21.7	35	24.8

Table 2.3 Free Text Responses To The Statement: 'Please give details with regard to any reservations'

A table to show the free text responses, collated from the feedback questionnaire, given by 4th year tutors when ask to give details of any reservations they had with regard to taking taking part in the Equine and Canine Clinical Examination PAL Classes. The table shows the number and percentage of responses by category.

Cohorts	Who Benefitted Most?			
	Tutees	Tutees/Tutors	Tutors	Staff
1st Year Tutees	55.1	32.6	9.0	3.3
GEP Tutees	33.1	45.5	18.2	3.2
4th Year Tutors	29.0	26.8	35.5	8.7

Table 2.4 Responses To The Question: 'Who do you think benefits most from this method of teaching?'

A table to show the responses collated from the feedback questionnaires from 2011 to 2014, given by tutors and tutees when asked whom they thought benefitted most from the Equine and Canine Clinical Examination PAL Classes. The figures in the table are percentages of total responses given.

2.2.4 Hypothesis 2: At the point of execution, 4th year tutors are perceived to have the skills required to deliver effective PAL interventions.

The questions used to investigate this hypothesis were taken from the tutee feedback questionnaire and focus on 1st year/GEP tutee perceptions of the design, organisation and delivery of the classes by the 4th year tutors. The following text refers to data presented in Table 2.5.

96.4% of tutee respondents strongly agreed or agreed that they were given a clear overview of why clinical skills are important at the start of the class, with 97.8% of tutees strongly agreeing or agreeing that it was made clear to them what they were expected to do during the class. Kruskal-Wallis rank sum tests gave P-values of 0.49 for the clear overview question results and 0.15 for student expectations, indicating that there was no significant difference in the responses given by 1st and GEP tutees to these questions.

All tutee respondents (100%) strongly agreed or agreed that the questions asked during the class were clear and understandable, with 99.8% also strongly agreeing or agreeing that the 4th year tutors were approachable and that they (the tutees) felt comfortable asking or answering questions. 98.6% of tutees strongly agreed or agreed that the pace of the class was appropriate. Kruskal-Wallis rank sum tests gave P-values of 0.50 for the clarity of presentation question results and 0.52 for tutor approachability, indicating that there was no significant difference in the responses given by 1st and GEP tutees to these questions.

80.6% of 1st year and GEP tutee respondents strongly agreed that they were given constructive feedback regarding their clinical skills during the class, with 80.6% strongly agreeing or agreeing that they were given a summary of what they have covered at the end of the class. 8.1% of students disagreed or strongly disagreed that they had been given a summary at the end of the class. Kruskal-Wallis rank sum tests gave P-values of 0.54 for the feedback question results and 0.09 for the summary question, indicating that there was no significant difference in the responses given by 1st and GEP tutees to these questions.

Questionnaire Respondent	Feedback Statement	Cohort	Likert Responses: Percentage of Total Respondents					
			SA	A	N	D	SD	NA
Tutee	We were given a clear overview of why clinical skills are important to us at the start of the class'	1st Year	63.6	32.1	3.2	0.5	0.0	0.5
		GEP	64.8	32.9	2.4	0.0	0.0	0.0
Tutee	What we were expected to do during the class was made clear to us'	1st Year	71.1	26.9	1.8	0.0	0.0	0.2
		GEP	64.8	32.9	2.4	0.0	0.0	0.0
Tutee	The pace of the class was appropriate'	1st Year	70.4	28.9	0.2	0.0	0.0	0.2
		GEP	67.6	31.0	1.0	0.5	0.0	0.0
Tutee	We were given constructive feedback about our own clinical skills during the class'	1st Year	49.0	36.4	12.8	1.8	0.0	0.0
		GEP	44.3	39.5	10.0	5.7	0.0	0.5
Tutee	The 4th Year students were approachable and I felt comfortable 'asking' or 'answering' questions with them'	1st Year	87.5	12.5	0.0	0.0	0.0	0.0
		GEP	91.9	7.6	0.0	0.0	0.5	0.0
Tutee	The questions that were asked during the class were clear and understandable'	1st Year	77.9	22.1	0.0	0.0	0.0	0.0
		GEP	75.2	24.8	0.0	0.0	0.0	0.0
Tutee	We were given a summary of what we had covered at the end of the class'	1st Year	51.5	31	9.8	7.1	0.2	0.5
		GEP	46.2	30.5	11.4	9.5	0.0	2.4

Table 2.5 Likert Scale Responses To Statements From Equine and Canine Clinical Examination PAL Classes: 2011 to 2014

A table to show the Likert scale responses given by tutees to statements in the Equine and Canine Clinical Examination PAL Classes feedback questionnaires, exploring tutee perceptions of the design, organisation and delivery of the classes by the 4th year tutors. The data refers to the percentage of total respondents by cohort who Strongly Agreed (SA), Agreed (A) Neither Agreed or Disagreed (N), Disagreed (D) or Strongly Disagreed (SD) with the statement. NA refers to responses where no answer was given.

2.2.5 Hypothesis 3: It is the perception of PAL tutors that the PAL clinical skills intervention provided a valuable opportunity to enhance their clinical examination and tutoring skills and knowledge.

The questions selected from the PAL feedback survey data to investigate this hypothesis focus on four areas; improving practical and clinical skills and experience, improving confidence, improving teaching/tutoring skills and improving communication skills. The following text refers to data presented in Tables 2.6, 2.7 and 2.8.

Improving Clinical and Practical Handling Skills and Experience

To investigate an improvement in practical and clinical skills, the results of two tutee and two tutor questions were analysed. The tutee questions focused on whether they were given adequate 'hands-on' time during the intervention and if the line of questioning during the session helped them learn and develop their clinical skills. The tutor questions asked if improving practical handling experience with horses and improving equine clinical skills and knowledge were reasons why 4th year respondents decided to volunteer for the equine PAL classes.

Virtually all tutees (99.5%) strongly agreed or agreed that they were given appropriate 'hands-on' time during the PAL intervention to practice their clinical skills. A Kruskal-Wallis rank sum test used to analyse this data in more depth returned a P-value of 0.0008 indicating that there was a significant difference in the responses given by 1st and GEP tutee groups. 87.5% of 1st years students strongly agreed with the statement compared to 78.6% of GEP respondents. 98.9% of the combined 1st year/GEP tutee cohort strongly agreeing or agreeing that the questions asked during the class helped their learning and development in this area. A P-value of 0.06 resulting from a Kruskal-Wallis rank sum test indicates that there was no different between 1st year and GEP responses to this statement.

68.4% of 4th years who volunteered for the equine clinical skills classes strongly agreed or agreed that they decided to do this because they wanted to get more practical handling experience with horses. 12.9% disagreed or strongly disagreed with the statement with 18.7% having no strong opinion either way. 93.7% of 4th year volunteers strongly agreed or agreed that a reason for getting involved in the equine classes was to improved their clinical examination skills and knowledge with 91.7% of 4th year respondents strongly agreeing or agreeing that an additional reason for volunteering was to increase their confidence in equine clinical examination.

Improving Confidence, Teaching/Tutoring Skills and Communication Skills

The questions used to investigate perceived improvements in confidence, teaching/tutoring and communication skills amongst 4th year tutor cohorts, included those investigating reasons why students had volunteered for the equine clinical skills interventions and if the experience of leading the canine clinical skills classes had led to changes in these areas.

76.8% of 4th year respondents, following the canine clinical skills PAL intervention, strongly agreed or agreed that being a peer tutor had increased their confidence in clinically examining animals, with only 3.6% disagreeing or strongly disagreeing with the statement. Just under a fifth (19.1%) indicated that they neither agreed nor disagreed.

91.2% of respondents who volunteered for the equine clinical skills classes strongly agreed or agreed that they wanted to develop their teaching skills, with 88.6% of respondents to the feedback questionnaire following the canine clinical skills interventions, strongly agreeing or agreeing that the experience of being a peer tutor had developed their teaching skills.

86.7% of respondents who took part in the equine classes strongly agreed or agreed that a reason for volunteering was to improve their communication skills. 79.7% of 4th year students also strongly agreed or agreed that the experience of being a peer tutor had improved their communication skills.

Table 2.8 shows that when 4th year tutors were asked to give reasons why they had not volunteered to take part in the equine PAL classes, 62.4% of respondents across the three years of the study cited time constraints or other commitments as the main reasons. ‘Other commitments’ was the most commonly cited reason for not volunteering for each of the three years of the study.

Questionnaire Respondent	Improving Clinical and Practical Handling Skills and Experience	Cohort	Likert Responses: Percentage of Total Respondents					
			SA	A	N	D	SD	NA
Tutee	We were given appropriate 'hands-on' time to practice our own clinical skills'	1st Year	87.5	12.2	0.0	0.3	0.0	0.0
		GEP	78.6	20.5	0.5	0.4	0.0	0.0
Tutee	The questions that were asked during the class helped me to learn and develop my clinical skills'	1st Year	78.4	20.3	0.9	0.2	0.0	0.2
		GEP	73.8	25.7	0.5	0.0	0.0	0.0
Tutor	I volunteered for the equine classes because I wanted to get more practical handling experience with horses'	4th Year	21.9	46.5	18.7	10.3	2.6	0.0
Tutor	I volunteered for the equine classes because I wanted to improve my own equine clinical examination skills and knowledge'	4th Year	48.1	45.6	3.8	2.5	0.0	0.0

Table 2.6 Likert Scale Responses To Statements From Equine and Canine Clinical Examination PAL Classes: 2011 to 2014

A table to show the Likert scale responses given by tutees and tutors to statements in the Equine and Canine Clinical Examination PAL Classes feedback questionnaires, exploring student perceptions of improving practical and clinical skills and experience. The data refers to the percentage of total respondents by cohort who Strongly Agreed (SA), Agreed (A) Neither Agreed or Disagreed (N), Disagreed (D) or Strongly Disagreed (SD) with the statement. NA refers to responses where no answer was given.

Questionnaire Respondent	Improving Confidence, Teaching/Tutoring Skills and Communication Skills	Cohort	Likert Responses: Percentage of Total Respondents					
			SA	A	N	D	SD	NA
Tutor	I volunteered for the equine classes because I wanted to increase my confidence in clinically examining horses'	4th Year	37.3	54.4	4.4	3.2	0.6	0.0
Tutor	Being a peer tutor has increased my confidence in clinically examining animals'	4th Year	13.8	63	19.1	3.1	0.5	0.5
Tutor	I volunteered for the equine classes because I wanted to develop my teaching/tutoring skills'	4th Year	23.9	64.7	8.5	1.7	0.5	0.7
Tutor	I volunteered for the equine classes because I wanted to improve my communication skills'	4th Year	30.4	56.3	12	1.3	0.0	0.0
Tutor	Being a peer tutor has improved my communication skills'	4th Year	16.9	62.8	16.9	2.7	0.2	0.5

Table 2.7 Likert Scale Responses To Statements From Equine and Canine Clinical Examination PAL Classes: 2011 to 2014

A table to show the Likert scale responses given by tutees and tutors to statements in the Equine and Canine Clinical Examination PAL Classes feedback questionnaires, exploring student perceptions of improving confidence, teaching/tutoring skills and communication skills. The data refers to the percentage of total respondents by cohort who Strongly Agreed (SA), Agreed (A) Neither Agreed or Disagreed (N), Disagreed (D) or Strongly Disagreed (SD) with the statement. NA refers to responses where no answer was given.

Response Categories	Cohort						Total	
	2011		2012		2013			
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Time Constraints	21	20.8	12	20.0	12	16.4	45	19.2
Other Commitments	41	40.6	26	43.3	34	46.6	101	43.2
Lack of Equine Knowledge	19	18.8	8	13.3	13	17.8	40	17.1
Not Comfortable Teaching	11	10.9	7	11.7	3	4.1	21	9.0
Other	9	8.9	7	11.7	11	15.1	27	11.5

Table 2.8 Free Text Responses To The Statement: 'If you did not volunteer for the equine classes (that's ok!) but why not?"

A table to show the free text responses, collated from the feedback questionnaire, given by 4th year tutors when ask to give details of reasons why they did not volunteer to take part in the Equine Clinical Examination PAL Classes. The table shows the number and percentage of responses by category.

2.3 Discussion

2.3.1 Hypothesis 1: Veterinary student tutors and tutees are comfortable with the concept of Peer Assisted Learning as a teaching methodology, where 'people from similar social groupings, who are not professional teachers, help each other to learn and learn themselves by teaching' (Topping 1996)

Nearly three quarters (72%) of 1st year/GEP tutees strongly disagreed or disagreed that they had reservations with regard to taking part in the PAL sessions, suggesting that in general, these cohorts were comfortable with being taught by tutors from more senior year groups. 49.6% of 4th year tutor respondents also strongly disagreed or disagreed that they had reservations regarding being involved in the PAL sessions. Therefore, while almost half of 4th year tutor respondents were content with being involved in the PAL interventions, they had more reservations compared to their tutee colleagues. This finding is supported by further analysis of the data, which shows that 31.2% of 4th year tutors compared to just 12% of 1st year/GEP tutees strongly agreed or agreed that they did have reservations prior to taking part in the PAL interventions. Greater reservations with regard to taking part in the PAL interventions among the tutor cohorts was understandable because they had the added pressure and responsibility of organising and delivering the teaching sessions. In addition, as the more senior and experienced students, they were expected to pass on accurate information and demonstrate correct clinical examination procedure to their more junior colleagues, which could potentially have increased their reservations with regard to being involved in the PAL intervention. Concerns regarding the expectation of passing on accurate information and demonstrating correct clinical technique is supported by analysis of free text answers given by 4th year tutors when asked to give reasons why they had reservations about teaching. The largest proportion of those who responded, 38.3% cited lack of confidence in their own knowledge as their main reservation while 22.0% cited a lack of confidence in their ability to teach.

When asked if they would like to be taught again by fellow students, almost all tutees (96.6%) strongly agreed or agreed with this statement. 86.4% of tutees also responded positively when asked if they would like to teach other veterinary students in the future. In addition, 86.3% of 4th year tutors responded positively when asked if they would like to teach again in a similar context, with 87.1% of tutor respondents also stated that they perceived the experience of being a peer tutor as being helpful to their future veterinary careers. The more positive responses given to these questions compared to the feedback given by tutors and tutees regarding reservations prior to experiencing the PAL intervention, suggest that experiencing PAL may have helped to both allay any prior reservations that both tutors and tutees had prior to the intervention and potentially enhance the largely positive perception of this teaching methodology already held by tutors and tutees alike.

Both 1st year/GEP tutees and 4th year tutors were asked in the feedback questionnaire who they thought benefited most from the clinical examination skills PAL interventions. Over half of the 1st year tutees (55.1%) thought that tutees benefited most with 32.6% indicating that they thought that tutees and tutors benefited equally. Only 9% felt that tutors benefitted the most from the intervention. The largest proportion of GEPs (45.5%) indicated with both tutors and tutees benefited equally with 33.1% suggesting that tutees benefitted the most. The percentage of GEP respondents who thought that tutors benefitted most (18.2%) was just over twice the proportion of 1st year tutees (9%) who thought that this was the case. The largest proportion of 4th year tutors (35.5%) thought that tutors benefitted most from the intervention with 29% indicating that tutees benefitted most and 26.8% suggesting that tutors and tutees benefitted equally. Only a small proportion of respondents, between 3.3% to 8.7%, across any of the tutor or tutee cohorts thought that staff benefitted most from the PAL interventions. This is an important finding in this instance as it suggests introducing the PAL classes to save staff time or to make up for lack of teaching resources was not a widely held perception or major concern across the cohorts. The fact that each cohort indicated that it benefited most from the intervention is understandable because the respondents have to base this answer on their own personal experience. It is however interesting that the proportion of respondents who thought that tutors benefitted most increases when moving from 1st year to GEP to tutor cohort data. The GEPs tend to be older than first year students and often have more life experience. They may therefore have had more experience of using and developing teaching and communication skills and therefore understand the positive impact that teaching can have on the tutor as well as the tutee. The 4th year tutors will have experienced PAL sessions as tutees and therefore they will have an understanding of the benefits of these interventions from both the tutor and tutee perspective. Most importantly however, the results do indicate that both the tutor and tutee cohorts perceived a reported strength of PAL, namely that it is beneficial to both tutors and the tutees alike (Topping 1996, Buckley et al. 2007, Ross et al. 2007).

Analysis of the feedback data from the clinical skills interventions therefore supports the hypothesis that that both veterinary student tutors and tutees are comfortable with the concept of PAL as a teaching methodology and that experiencing an intervention may actually enhance this perception. While it is important to established that students are comfortable with PAL as a teaching methodology, an intervention can only be deemed a success if the tutors have the capability to lead and deliver the teaching material and that both tutors and tutees benefit from the experience. The following two hypotheses were formulated to investigate these factors in relation to the clinical examination skills PAL interventions.

2.3.2 Hypothesis 2: At the point of execution, 4th year tutors are perceived to have the skills required to deliver effective PAL interventions.

Virtually all tutee respondents (96.4%) strongly agreed or agreed that they were given a clear overview of the importance of developing their clinical skills at the start of the class, with 97.8% strongly agreeing or agreeing that they were clearly told what was expected of them during the class. Virtually all tutee respondents (99.5%) also strongly agreed or agreed with the statements that they were given appropriate 'hands-on' time during the canine PAL intervention to practice their clinical examination skills and that the questions asked during the classes helped their learning and development (98.9%). These responses therefore support the hypothesis that, according to 1st year/GEP tutee perceptions, At the point of execution, 4th year tutors are perceived to have the skills required to deliver effective PAL interventions.

An interesting caveat to the tutee statement that they were given appropriate 'hands-on' time during the canine PAL intervention to practice their clinical examination skills, is that there was a statistically significant difference in the responses given by the 1st year and GEP cohorts. While the responses given by both cohorts to this statement were generally very positive, the 1st year students were more positive with 87.5% strongly agreeing with the statement compared to 78.6% of GEPs. While there was a statistically significant difference between the cohorts in response to this statement, it may not be of great significance in this instance because both groups responded very positively. It does however highlight the importance of recognising the demographic differences that exist within undergraduate students' cohorts and how this may impact on the students' perceptions and experiences of PAL interventions.

2.3.3 Hypothesis 3: It is the perception of PAL tutors that the PAL clinical skills intervention provided a valuable opportunity to enhance their clinical examination and tutoring skills and knowledge.

In order to investigate the students' perception of PAL as a teaching methodology, data looking at the proportion of the cohorts who volunteered for the equine clinical skills classes was analysed, along with feedback data relating to reasons given for wanting to volunteer for the equine classes.

In 2011 16.2% of the 4th year cohort volunteered for the equine class, with 40.3% in 2012, 28.0% in 2013 and 19.3% in 2014. The pre-intervention briefing session was introduced in 2012, which would explain the increase in volunteers between 2011 and 2012. In 2013 there were clashes between the 4th year timetable and the equine PAL classes, which would explain the drop in percentage between 2012

and 2013. In 2014 an administrative error meant that approximately half the 4th year cohort did not complete the feedback form and therefore the proportion that volunteered from the equine classes in 2014 is misleading. The reasons behind these variations in the number of volunteers year on year do however illustrate the impact and importance of briefing and preparing tutors prior to an intervention and careful scheduling of PAL classes within the timetable to the overall success of an intervention (Wadoodi & Crosby 2002, Nestel & Kidd. 2005, Baillie et al. 2009).

These percentages are encouraging for a voluntary activity because they suggest that a good proportion of students had sufficient understanding of the potential educational benefits of participating as a tutor in a PAL class to set aside time to be involved. The significance of this commitment is magnified when the time pressures and workload associated with a veterinary undergraduate degree course are taken into account. The significance of the influence that time pressures and workload had on a student's decision to volunteer for the equine PAL classes is illustrated by the fact that 62.4% of the free text responses given by students who did not participate in the equine classes, when asked to give reasons why they did not volunteer, related to lack of time and other academic or extra-curricular commitments.

More than two thirds (68.4%) of 4th year tutors strongly agreed or agreed that they decided to volunteer for the equine clinical examination class to improve their equine handling skills. Over 90% strongly agreed or agreed that they both wanted to improve their equine clinical examination skills and knowledge (93.7%) and increased their confidence in equine clinical examination (91.7%). These results suggest that while an opportunity to improve equine handling skills was a strong motivation for students to volunteer for the equine classes, the desire to improve equine clinical examination skills, knowledge and confidence proved to be a stronger motivator. Since these classes had an equine focus, this may have been because the students who volunteered had a greater interest in horses and therefore already possessed superior basic equine handling skills and knowledge. This would therefore suggest, as these results show, that the motivation to volunteer would be driven more by a desire to improve clinical examination skills and knowledge rather than improving basic equine handling skills.

These high positive percentage responses given by PAL tutors to questions relating to personal improvement of practical skills and knowledge is encouraging from the perspective of PAL as a teaching methodology, because it suggest that the students understand that the teaching process can have a positive impact on the development of the skills and knowledge of the tutor as well as the tutee. It also suggests that they perceive the potential of PAL as a platform for the teaching, learning and development of practical skills and knowledge.

However positive the students' perceptions and expectations of PAL as a teaching methodology, an intervention can only be deemed successful if it lives up to and matches these perceptions and expectations. Further analysis of the 4th year tutor feedback data showed that 76.8% of 4th year

respondents, following the canine clinical skills PAL intervention, strongly agreed or agreed that being a peer tutor had increased their confidence in clinical examination skills and knowledge. While this result is taken from feedback data relating to the canine clinical examination PAL classes, it is fair to compare this result with the perceptions data discussed earlier relating the equine clinical examination PAL classes because both PAL interventions were very similar in terms of design, implementation and academic content and therefore the students would have had similar experiences. Comparison of these results therefore indicated that these equine and canine PAL clinical examination skills classes can be deemed a success based on the positive qualitative feedback from the tutors, which indicated that the perceived improvement in clinical skills and knowledge did live up to and matched the perceived pre-intervention learning expectations of the student tutors.

Another significant finding from the feedback data, from the point of view of faculty and the veterinary profession as a whole, was that virtually all 4th year tutor respondents (91.2%) who volunteered from the equine clinical skills PAL classes strongly agreed or agreed that a reason for volunteering was to develop their teaching skills and 86.7% of respondents strongly agreed or agreed that they volunteered to improve their communication skills. An ability to teach and communicate effectively are increasingly being recognised as important skills that medical and veterinary undergraduates should learn and develop while at university (Nestel et al. 2005, Burke et al. 2007, Field et al. 2007, Ross et al. 2007). These results are therefore encouraging because they suggest that there is an understanding within the undergraduate veterinary student body of the importance of teaching, there is a willingness to learn and develop teaching skills and knowledge and students have a strong perception that PAL interventions can provide an effective platform on which undergraduates can build and develop their teaching skills and experience. The success and effectiveness of these PAL classes with regards to the development of teaching skills is further demonstrated by the fact that 88.6% of respondents to the feedback questionnaire following the canine clinical skills interventions, strongly agreed or agreed that the experience of being a peer tutor had enabled them to develop their teaching skills.

These findings therefore support the hypothesis that it is the perception of tutors and tutees that the PAL clinical skills interventions provided a valuable opportunity for them to enhance their clinical examination and tutoring skills and knowledge.

Chapter 3 Multiple Choice Question (MCQ) study evaluating improvement in knowledge following participation in a PAL clinical skills intervention

3.1 Methodology

3.1.1 Development of Multiple Choice Questions (MCQ)

In order to conduct the study, a pre- and post-intervention methodology was used, in which each student completed two 'matched' sets of ten multiple choice questions (MCQs), Set A (Appendix B1) and Set B (Appendix B2) at some point during the PAL intervention process. As part of their canine clinical examination skills training, the students are provided with specific reference information, for example normal rectal temperature and heart rate ranges for different species, which they are expected to memorise. The MCQ questions were formulated using this information to enable any potential improvement in student knowledge as a result of experiencing the PAL canine clinical examination skills intervention to be measured. The point during the intervention and the order in which the question sets were completed varied according to the group to which each individual was assigned. It was important to ensure that students could complete the MCQ papers within five minutes, in order to minimise the impact of the MCQ study on the teaching time available for the students to complete the Canine Clinical Skills PAL intervention. The number of questions for each paper was therefore set at ten to maximise the number of items thereby giving the best precision/power taking into account the time constraints available.

Two MCQ sets, consisting of different 'matched' questions, were used to minimise the impact of memory retention on the results. The question sets were balanced in terms of knowledge level and difficulty to facilitate the measurement of any improvement in core knowledge that may have occurred as a result of the PAL intervention.

A pilot study was carried out to test the MCQ sets prior to the intervention involving eight volunteer 3rd year BVM&S undergraduate students. The students were approached immediately after a practical class, asked to volunteer and then immediately given a question set to complete on the spot, so that they had no prior knowledge or time to prepare. MCQ sets A and B were allocated in turn as the students agreed to volunteer, so that four students completed set A and four completed set B.

3.1.2 Study Design

Both PAL 4th year tutors and 1st year/GEP tutees were included in the study in an attempt to measure core knowledge improvement across all student groups.

From an ethical standpoint, it was important to obtained informed consent from the students before they took part in the study. In order to do this, a consent form was included as a front page to each multiple choice question paper, which the students were asked to read through and sign before proceeding (Appendix B3). The students were also asked to input their university examination number on each consent form to enable question sets to be matched for each individual during data processing at the end of study. It was emphasised on the consent form that participation was voluntary and was not connected to any course or class and that the results would also not have any effect on grades or standing in any course. It was also made clear that the examination number would only be used by the author (NS) to match question sets for each individual and all matched data would be anonymised once the data had been entered into a database. This also ensured that staff members involved in the study would be blinded to individual student results.

Initially, the inclusion of a control group of students taken from the same cohorts, who would have completed both questions sets but not taken part in the intervention, was considered but ethical considerations precluded having a group of students that did not receive the intervention at all, as they may have been disadvantaged. Therefore, in order to include an effective control group, a methodology was developed where a group of students completed both questions sets before receiving the intervention.

As mentioned previously, every student taking part in the study completed both question sets at some point during the PAL intervention process, with the point during the intervention and the order in which the question sets were completed, varying according to the group to which each individual was assigned.

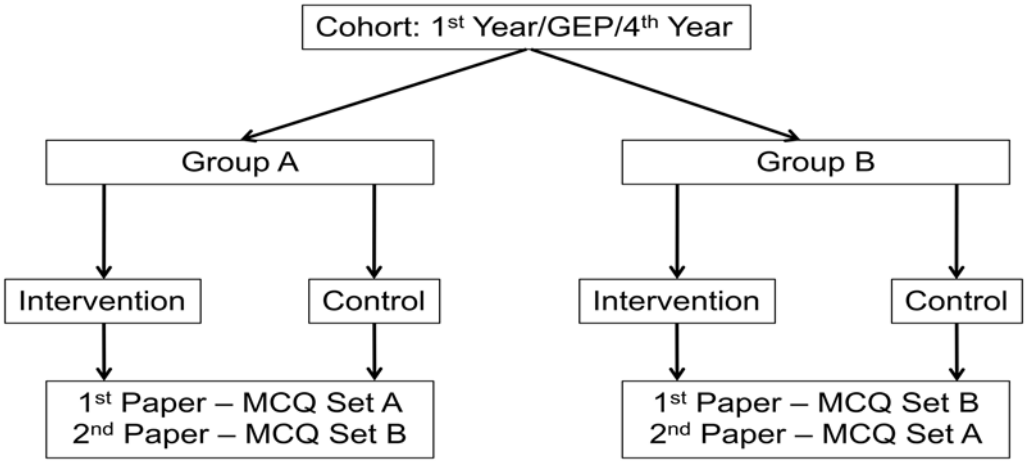


Figure 3.1 Division of the PAL tutor and tutee cohorts for the MCQ Study

At the planning stage of the MCQ study, each cohort (1st year, GEP and 4th year) was divided in two equal groups (Group A and Group B) using an alphabetical list. Each group was then subdivided equally into an Intervention Group and a Control Group (Figure 3.1). All students involved in the study completed two MCQ papers, MCQ Set A and MCQ Set B. The first papers were completed at the pre-PAL plenary sessions. Intervention Group A and Control Group A completed MCQ Set A first and Intervention Group B and Control Group B completed MCQ set B first. Control Groups A and B then completed the other MCQ paper immediately prior to the PAL intervention and Intervention Groups A and B completed their other MCQ paper immediately after the PAL intervention.

3.1.3 Study Implementation

In order to introduce and inform the students taking part in the PAL interventions about the MCQ study, a briefing was held for the 1st and 4th year cohorts at their pre-intervention PAL briefing sessions and for the GEPs at a window in the timetable when the whole cohort were together. The briefing sessions was used to explain why the study was being conducted and what would be involved if the students decided to participate. It was emphasised that participation was entirely voluntary, the results of the test would have no bearing whatsoever on any BVM&S assessment associated with the PAL classes and that all information given would be completely anonymous, with any personal information, for example exam numbers, only used to collate papers and results.

A key factor in ensuring the statistical robustness of the MCQ study was standardising the time period between completion of the first question set and the PAL intervention, as far as timetabling constraints would allow, for both the control and experimental groups, to minimise the effect that any variation could have on performance.

The pre-intervention PAL briefing sessions provided the ideal opportunity for both the experimental groups and control groups for each cohort to complete their first question sets at the same time. Therefore, following the MCQ briefing, the students who volunteered for the study were asked to organised themselves into their PAL groups. This was done to ensure that the correct MCQ sets were given to the correct groups (see figure 3.1) and facilitate collation of the question papers once completed. The students were instructed not to consult while answering the questions and were supervised by a member of the project team during the process. The papers were collected as the students completed them and placed in clearly marked envelopes for each control and experimental group to help facilitate the processing of the results at a later date.

The second MCQ sets were completed at the time of the PAL classes. In order for the study to run smoothly, to avoid errors and ensure that it did not impact on the PAL teaching time, it was essential to be well prepared and organised prior to the sessions. In order to ensure this, a detailed logistics timetable (Appendix B4) was created, which clearly showed the tutee and tutor groups attending each session, the number of individuals in each small group, the category, experimental or control, to which the groups were assigned, the MCQ question set required and when, either before or after the PAL intervention, the question paper needed to be completed.

At the start of each PAL session, the logistics timetable was consulted and, if the 4th year tutor groups fell into the control category, members of the project team would approach each group as they were setting up their station. Individual students were asked if they had completed the first set of questions at the briefing session and, if so, whether they would be willing to complete the second question set prior to the PAL session starting. The appropriate MCQ set was then given to participating students who were asked to complete it without conferring with other students. Members of the project team supervised the students whilst they were undertaking the test, collected the papers once completed and placed them in a clearly marked envelope.

When 1st year and GEP tutees arrived for the teaching sessions, they were asked to sit at a table in the centre of the room for a short introductory briefing. The MCQ study was discussed as part of this briefing and, if the groups attending fell into the control category, individuals, who had completed the first set of questions at the briefing session, were asked whether they would be willing to complete the second question set prior to the PAL teaching session. The appropriate MCQ set was then given to participating students at the end of the briefing, who were asked to complete the paper without conferring with other students. Members of the project team supervised the students whilst they were undertaking the test, collected the papers once completed and placed them in a clearly marked envelope.

4th year tutor groups, within the experimental categories, were approached by members of the project team when clearing their stations at the end of the PAL teaching session. Individuals were asked if they had completed the first set of questions at the briefing session and, if so, whether they would be willing to complete the second question at that point in time. The appropriate MCQ set was then given to participating students who were asked to complete it without conferring with other students. Members of the project team supervised the students whilst they were undertaking the test, collected the papers once completed and placed them in a clearly marked envelope.

Similarly to the control groups, 1st year and GEP tutee groups within the experimental categories attended a short introductory briefing prior to the PAL teaching session, during which the MCQ study was discussed. Individuals who had completed the first set of questions at the briefing session were asked if they were willing to complete the second question after the PAL session had taken place. At the end of every PAL session the tutee groups were asked to return to the table at the centre of the room for a debrief, where they were asked to complete a feedback questionnaire. At this point students participating in the MCQ study were also given the appropriate MCQ set and asked to complete it at that point in time without conferring with other students. Members of the project team supervised the students whilst they were undertaking the test, collected the papers once completed and placed them in a clearly marked envelope.

3.1.4 Study Evaluation

Collation of Questionnaires

At the end of the PAL teaching sessions, the examination numbers entered by the students at the top of the question sheet were used to pair MCQ set A with MCQ set B for each participating individual. The exam number was then checked against the cohort list to confirm which experimental or control group the individual was a member of and the paired question sets were added to the appropriate envelope. There were a number of instances where a student had completed a question set at the briefing session but then failed to complete the second set at the PAL teaching session, so a pairing couldn't be made. Any question sets that couldn't be paired were eliminated from the study.

Once all the question papers had been paired and checked against the cohort lists to ensure they were collated into the correct control and experimental groups, the data from each question paper was entered into a Microsoft Excel spreadsheet to enable further statistical analysis.

student_id	year	date	qset	run	pal_group	qnum	answer
B123456	4	27/04/15	a	1	y4_e1	1	a
B123456	4	27/04/15	a	1	y4_e1	2	c
B123456	4	27/04/15	a	1	y4_e1	3	c
B123456	4	27/04/15	a	1	y4_e1	4	b
B123456	4	27/04/15	a	1	y4_e1	5	b
B123456	4	27/04/15	a	1	y4_e1	6	b
B123456	4	27/04/15	a	1	y4_e1	7	d
B123456	4	27/04/15	a	1	y4_e1	8	b
B123456	4	27/04/15	a	1	y4_e1	9	d
B123456	4	27/04/15	a	1	y4_e1	10	a

Table 3.1 Example of an MCQ question set entry in the data collation Excel spreadsheet

Table 3.1 is an example of a question paper entry in the spreadsheet. The first column is the student exam number, the second is the year of study on the BVM&S undergraduate course, the third is the date the questionnaire was completed and the fourth column is the question set. The fifth column 'run' indicates if the student completed the paper first or second and the sixth is the small PAL group that the individual belongs to. The seventh column 'qnum' refers to the question number on the paper and the final column is the multiple choice answer selected by the student for each question.

3.1.5 MCQ Data Analysis

Following the collation of the MCQ data into the Excel spreadsheet, further data processing was performed to generate a score out of 100 for each MCQ paper. Each student included in the study therefore had two scores out of 100 allocated to them, one for MCQ Set A and one for MCQ Set B. This data was then collated into another Excel spreadsheet and filters were applied so that the data could be divided in different ways to enable further analysis.

For the majority of the MCQ data analysis, the mean score out of 100 was calculated for each MCQ paper; MCQ Set A and MCQ Set B, for each of the four groups; Control Group A, Intervention Group A, Control Group B and Intervention Group B, by cohort. The mean scores for the groups within each cohort were then compared against each other in order to try and identify any trends in the data. Unpaired t-tests were performed with 95% confidence intervals using GraphPad Software QuickCalcs

t-test calculator (http://graphpad.com/quickcalcs/ttest1.cfm) in order to identify any statistically significant differences between the group data sets.

3.1.6 Contribution by NS to the MCQ Study

The identification of a need to quantify any influence that the PAL interventions had on the canine clinical examination knowledge of the tutors and tutees and the idea of using an MCQ study to do this was the work of NS. NS also designed the questions and the format of the question papers used in the study, piloted the questions with third year students and produced a detailed logistical plan to ensure that the correct papers were completed by the experimental and control groups at the correct times. NS attended the PAL classes in 2015 to oversee the implementation of the MCQ study, collected and marked the questions papers and collated the results into an Excel spreadsheet to enable further data analysis.

3.2 Results

3.2.1 Glossary

The following glossary has been included in order to aid the readers understanding and interpretation of the results that follow:

- MCQ – Abbreviation for Multiple Choice Question
- MCQ Set A – Refers to Multiple Choice Question Set A
- MCQ Set B – Refers to Multiple Choice Question Set B

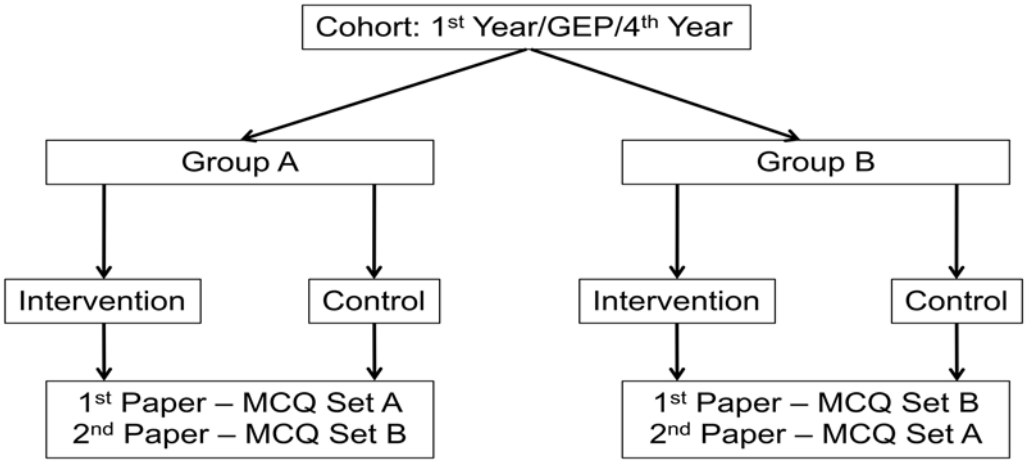


Figure 3.1 Division of the PAL tutor and tutee cohorts for the MCQ Study

At the planning stage of the MCQ study, each cohort (1st year, GEP and 4th year) was divided in two equal groups (Group A and Group B) using an alphabetical list. Each Group was then subdivided equally into an Intervention Group and a Control Group (Figure 3.1). All students involved in the study completed two MCQ papers, MCQ Set A and MCQ Set B. The first papers were completed at the pre-PAL plenary sessions. Intervention Group A and Control Group A completed MCQ Set A first and Intervention Group B and Control Group B completed MCQ set B first. Control Groups A and B then completed their other MCQ paper immediately prior to the PAL intervention and Intervention Groups A and B completed their other MCQ paper immediately after the PAL intervention.

3.2.2 PAL MCQ Results

	Tutors	Tutees			Total Tutors & Tutees
		1st Year	GEP	Total Tutees	
Total Number of Students in Cohort	161	133	45	178	339
Number of Students in the MCQ study	75	55	32	87	162
Number of Students as Percentage of Total Cohort	46.6	41.4	71.1	48.9	47.8
Number of Students in Control Group A (Qset A Completed First)	18	9	9	18	36
Number of Students in Control Group B (Qset B Completed First)	19	17	8	25	44
Total Number of Students in Control Groups	37	26	17	43	80
Number of Students in Intervention Group A (Qset A Completed First)	14	10	8	18	32
Number of Students in Intervention Group B (Qset B Completed First)	24	19	7	26	50
Total Number of Students in Intervention Groups	38	29	15	44	82

Table 3.2 A summary of the number of students that took part in the PAL MCQ study

A table to show the total number of veterinary undergraduate students in the 2015 4th year tutor, 1st year and GEP tutee cohorts and the proportion of the students in these cohorts that took part in the PAL MCQ study. The table also shows the number of students in each Control and Intervention Group for each tutor and tutee cohort.

46.6% (75) of the total 4th year tutor cohort and 48.9% (87) of the 1st year/GEP tutee cohorts completed both MCQ Set A and MCQ Set B and were therefore included in the study. Comparison of the total number of students in the control and intervention groups shows that there was a balance of numbers across the cohorts but imbalance between the number of students does emerge for certain cohorts when the numbers are divided into groups A and B. Control Group B (17) for example for 1st year tutees contains almost twice as many individuals as Control Group A (9).

Control Groups A - MCQ Set A Completed First	Run 1 Qset A	Run 2 Qset B	Difference (Run 2 - Run 1)	p-value
Tutor Control Group A - Completed Question set A first	88.9	76.1	-12.8	**0.0033**
1st Year Tutee Control Group A - Completed Question set A first	76.7	68.9	-7.8	0.168
GEP Tutee Control Group A - Completed Question set A first	87.8	74.4	-13.4	**0.0116**
Total Tutee Control Group A - Completed Question set A first	82.2	71.7	-10.5	**0.0084**
Intervention Groups A - MCQ Set A Completed First				
Tutor Intervention Group A - Completed Question set A first	92.1	71.4	-20.7	**0.0001**
1st Year Tutee Intervention Group A - Completed Question set A first	82.0	78.0	-4.0	0.4206
GEP Tutee Intervention Group A - Completed Question set A first	88.8	82.5	-6.3	0.1685
Total Tutee Intervention Group A - Completed Question set A first	85.0	80.0	-5.0	0.1457

Table 3.3 Mean scores for each MCQ Set by tutor and tutee cohort for Control and Intervention Groups A

A table to show the mean scores out of 100 for each MCQ Set (QSet A and QSet B) by tutor and tutee cohort for Control and Intervention Groups A, that completed MCQ Set A (QSet A) first (Run 1) at the pre-intervention briefings. The 'Difference' column shows the result when the figure in column 'Run 1' is subtracted from the figure in column 'Run 2' and is therefore the difference in mean score between the MCQ Set B paper and the MCQ Set A paper. The p-value column is the results of unpaired t-tests run with 95% confidence intervals between the corresponding data sets.

The negative numbers shown in the 'Difference' column in Table 3.3 for both the Control and Intervention Groups, show that the students across all cohorts achieved higher scores for MCQ Set A compared to MCQ Set B. The p-values generated by unpaired t-tests run with 95% confidence intervals, indicate that there was a statistically significant difference between the mean scores for MCQ Set A and MCQ Set B for Tutor Control Group A, Total Tutee Control Group A and GEP Tutee Control Group A, the student members of which all completed MCQ Set A first and MCQ Set B second immediately before the PAL intervention. There was also a statistically significant difference between MCQ Set A and MCQ Set B for Tutor Intervention Group A the members of which completed MCQ Set A first and MCQ Set B immediately after experiencing the PAL intervention.

Control Groups B - MCQ Set B Completed First	Run 1 Qset B	Run 2 Qset A	Difference (Run 2 - Run 1)	p-value
Tutor Control Group B - Completed Question set B first	78.4	89.5	11.1	**0.0015**
1st Year Tutee Control Group B - Completed Question set B first	77.1	82.9	5.8	0.2449
GEP Tutee Control Group B - Completed Question set B first	67.5	86.3	18.8	**0.0066**
Total Tutee Control Group B - Completed Question set B first	74.0	84.0	10.0	**0.0139**
Intervention Groups B - MCQ Set B Completed First				
Tutor Intervention Group B - Completed Question set B first	75.0	92.9	17.9	**0.0001**
1st Year Tutee Intervention Group B - Completed Question set B first	74.7	86.8	12.1	**0.0068**
GEP Tutee Intervention Group B - Completed Question set B first	72.9	84.3	11.4	**0.0169**
Total Tutee Intervention Group B - Completed Question set B first	74.2	86.2	12.0	**0.0006**

Table 3.4 Mean scores for each MCQ Set by tutor and tutee cohort for Control and Intervention Groups B

A table to show the mean scores out of 100 for each MCQ Set (QSet B and QSet A) by tutor and tutee cohort for Control and Intervention Groups B, that completed MCQ Set B (QSet B) first (Run 1) at the pre-intervention briefings. The 'Difference' column shows the result when the figure in column 'Run 1' is subtracted from the figure in column 'Run 2' and is therefore the difference in mean score between the MCQ Set A paper and the MCQ Set B paper. The p-value column is the results of unpaired t-tests run with 95% confidence intervals between the corresponding data sets.

Comparison of the mean scores for MCQ Set B and MCQ Set A and the positive numbers in the 'Difference' column in Table 3.4 across both the Control and Intervention Groups, show that similarly to Control and Intervention Groups A in Table 3.3, the students in Control and Intervention Groups B across all cohorts also achieved higher scores for MCQ Set A compared to MCQ Set B. The p-values generated for the Control and Intervention Groups B, where the student members completed MCQ Set B first and MCQ Set A second, indicate that there was a statistically significant difference between the means for all cohorts across both the control and intervention groups except for the First Year Tutee Control Group B.

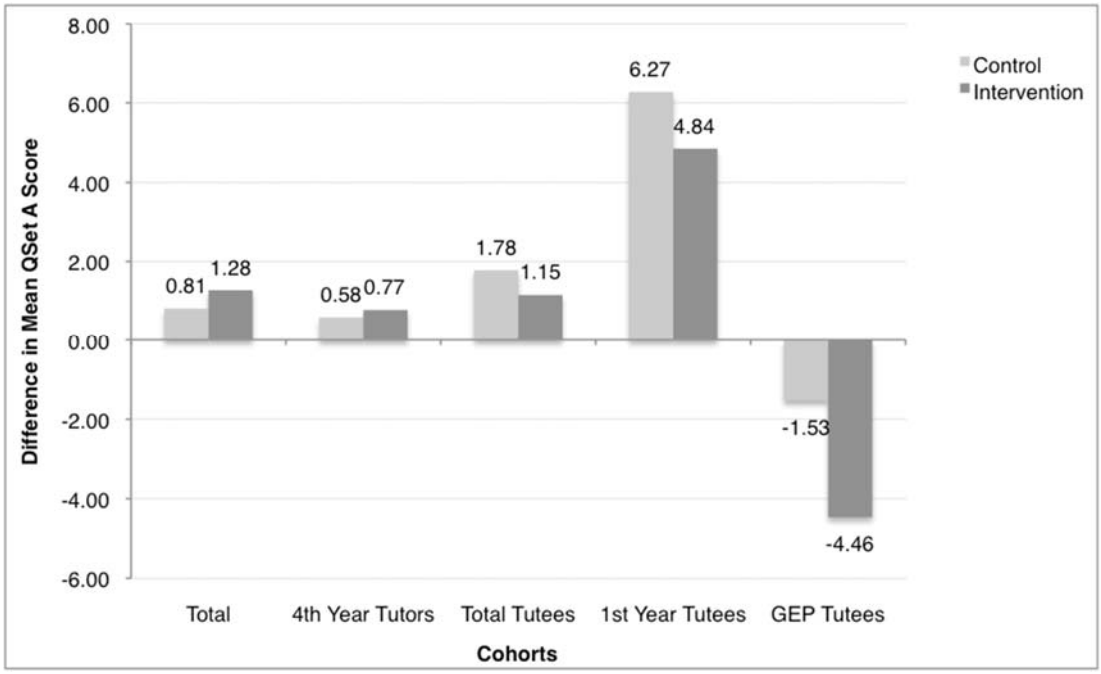


Figure 3.2 A Graph to show the difference in mean score for MCQ Set A paper between Control and Intervention Groups A and Control and Intervention Groups B by Tutor and Tutee cohorts.

The values for the light grey columns represent the difference in mean score by cohort for MCQ Set A for the Control Groups and were calculated by subtracting the mean score for Control Groups A, who completed MCQ Set A first, from the mean score of Control Groups B who completed MCQ Set A second. The values for the dark grey columns represent the equivalent information for the Intervention Groups and were calculated in the same way. The light grey column for '4th Year Tutors' for example gives a value of 0.58 which shows that the mean score for the Tutor Control Group B (Mean Score = 89.5) was 0.58 percentage points higher than Tutor Control Group A (Mean Score = 88.9). Tutor Control Group B therefore on average achieved higher scores than Tutor Control Group A for the same MCQ Set A paper. It is important to note however when analysing these figures, that one correct answer in an MCQ paper is equivalent to 10 points and therefore the differences in mean scores between the MCQ papers illustrated in Figure 3.3 are very small.

Figure 3.2 shows that the 4th year Tutor, Total Tutee and 1st Year Tutee Control and Intervention Groups B achieved higher mean scores for MCQ Set A than Control and Intervention Groups A. The GEP Control and Intervention Groups B however in contrast achieved lower scores than Control and Intervention Groups A. Figure 3.3 shows that difference in mean score between the 4th year tutor

Intervention Groups for MCQ Set A was higher compared to the equivalent Control Groups. The data for total tutees and 1st year tutees however shows that the difference in mean score between the Control Groups for MCQ Set A was higher compared to the Intervention Groups. The difference in mean score for the GEP Intervention Groups is more negative compared to the Control Groups suggesting that the Intervention Group who completed MCQ Set A second performed less well than the equivalent Control Group.

Unpaired t-test were run with 95% confidence intervals, using MCQ Set A score data, to compare the performance of all possible combinations of Control and Intervention Groups with in each cohort, to assess whether any statistically significant differences in score could be identified.

Cohort	Compared Groups	p-value
4th Year Tutors	Control Group A v Control Group B	0.9213
Total Tutees	Control Group A v Control Group B	0.5945
1st Year Tutees	Control Group A v Control Group B	0.1827
GEP Tutees	Control Group A v Control Group B	0.7237
4th Year Tutors	Control Group A v Intervention Group A	0.3846
Total Tutees	Control Group A v Intervention Group A	0.4454
1st Year Tutees	Control Group A v Intervention Group A	0.3574
GEP Tutees	Control Group A v Intervention Group A	0.7641
4th Year Tutors	Intervention Group A v Intervention Group B	0.7854
Total Tutees	Intervention Group A v Intervention Group B	0.7336
1st Year Tutees	Intervention Group A v Intervention Group B	0.3158
GEP Tutees	Intervention Group A v Intervention Group B	0.3079
4th Year Tutors	Control Group B v Intervention Group B	0.2109
Total Tutees	Control Group B v Intervention Group B	0.4836
1st Year Tutees	Control Group B v Intervention Group B	0.3096
GEP Tutees	Control Group B v Intervention Group B	0.7165

Table 3.5 The results of unpaired t-test comparing the mean scores for MCQ Set A across all combinations of Control and Intervention Groups by cohort

A table to show the p-values generated with 95% confidence intervals by unpaired t-tests run to compare the mean scores for MCQ set A across all combinations of Control and Intervention Groups by cohort.

The p-values in Table 3.5 show that there was no statistically significant difference between the MCQ Set A scores for any of the possible group combinations across all Tutor and Tutee cohorts.

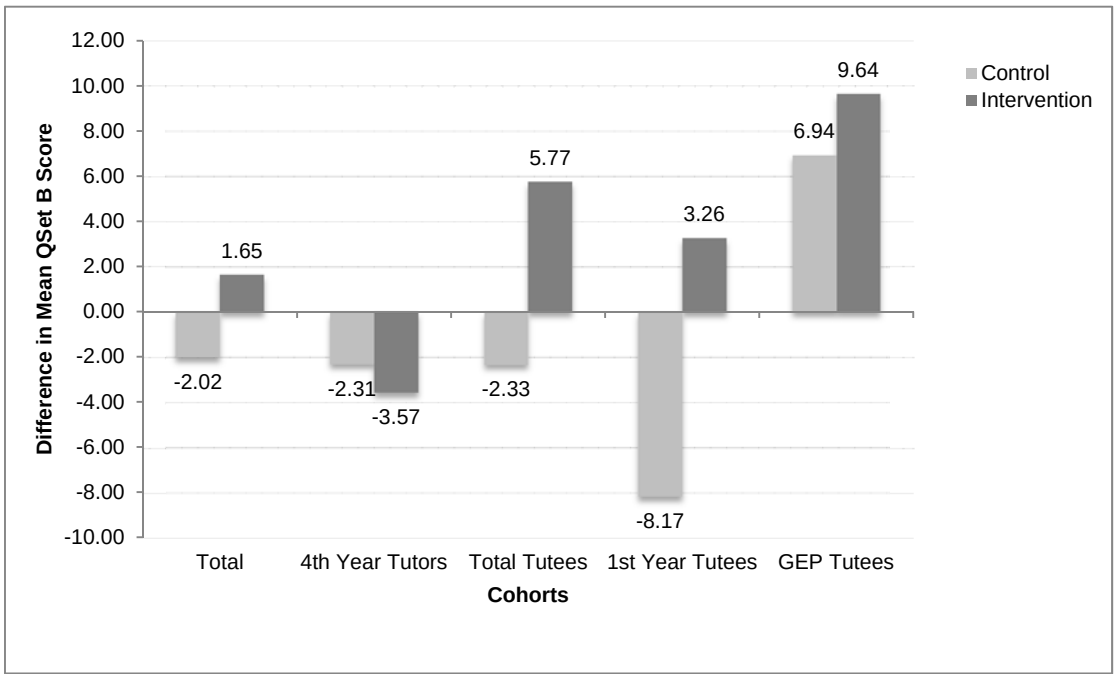


Figure 3.3 A Graph to show the difference in mean score for MCQ Set B paper between Control and Intervention Groups B and Control and Intervention Groups A by Tutor and Tutee cohorts.

The values for the light grey columns represent the difference in mean score by cohort for MCQ Set B for the Control Groups and were calculated by subtracting the mean score for Control Groups B, who completed MCQ Set B first, from the mean score of Control Groups A who completed MCQ Set B second. The values for the dark grey columns represent the equivalent information for the Intervention Groups and were calculated in the same way.

The results show that 4th year tutors in Control and Intervention Groups A achieved lower mean scores for MCQ Set B than Control and Intervention Groups B. At total tutee Level, the figure of -2.33 for the Control groups shows that Control Group A, who completed MCQ set B second, achieved a lower mean score than Control Group B who completed MCQ Set B first. In contrast to this however, the total tutee Intervention Group figure of 5.77 indicates that Intervention Group A, who completed MCQ set B second, achieved a higher mean score than Intervention Group B who completed MCQ Set B first. The graph shows that similar trend was also seen for the 1st Year Tutee cohort with Control Group A achieving a lower mean score than Control Group B and Intervention Group A achieving a higher mean score than Intervention Group B. The GEP Tutee data shows that both Control (6.94) and Intervention (9.64) Groups A achieved higher mean scores for MCQ Set B that Control and Intervention Groups B.

Cohort	Compared Groups	p-value
4th Year Tutors	Control Group B v Control Group A	0.5476
Total Tutees	Control Group B v Control Group A	0.6102
1st Year Tutees	Control Group B v Control Group A	0.2162
GEP Tutees	Control Group B v Control Group A	0.2736
4th Year Tutors	Control Group B v Intervention Group B	0.3018
Total Tutees	Control Group B v Intervention Group B	0.9548
1st Year Tutees	Control Group B v Intervention Group B	0.6614
GEP Tutees	Control Group B v Intervention Group B	0.3182
4th Year Tutors	Intervention Group B v Intervention Group A	0.3187
Total Tutees	Intervention Group B v Intervention Group A	0.0993
1st Year Tutees	Intervention Group B v Intervention Group A	0.5104
GEP Tutees	Intervention Group B v Intervention Group A	**0.0425**
4th Year Tutors	Control Group A v Intervention Group A	0.2641
Total Tutees	Control Group A v Intervention Group A	**0.0248**
1st Year Tutees	Control Group A v Intervention Group A	0.0602
GEP Tutees	Control Group A v Intervention Group A	0.1688

Table 3.6 The results of unpaired t-test comparing the mean scores for MCQ Set B across all combinations of Control and Intervention Groups by cohort

A table to show the p-values generated with 95% confidence intervals by unpaired t-tests run to compare the mean scores for MCQ set B across all combinations of Control and Intervention Groups by cohort.

The p-values in table 3.6 indicate that there was no statistically significant difference between the MCQ Set B scores for any of the possible group combinations across all Tutor and Tutee cohorts, except for Intervention Group B versus Intervention Group A for GEP Tutees (p-value = 0.0425) and Control Group A versus Intervention Group A for Total Tutees (p-value = 0.0248) where the p-values indicate that there was a statistically significant difference between these data sets.

3.3 MCQ Study Discussion

The results of the MCQ study show that just under half of both the 4th year tutor cohort (46.6%) and the combined 1st year/GEP tutee cohorts (48.9%), that took part in the Canine Clinical Examination Skills PAL classes in May 2015, completed and submitted both MCQ Set A and MCQ Set B papers for marking and were therefore included in the MCQ study. The main reason why half the cohorts were not included in the study was that participation was voluntary, so a proportion of tutors and tutees decided not to be involved. Also, participants could decide to opt out at any point in the process and therefore some individuals completed the first set of questions at the pre-PAL plenary sessions but then decided not to complete the second set of questions at the time of the PAL intervention, so their incomplete data set was excluded from the study.

As part of the design and preparation for the study, each cohort was divided equally into four equal sections to form the two Control Groups A and B and the two Intervention Groups A and B. A knock on effect of voluntary participation combined with the exclusion of incomplete MCQ set pairs for some individuals meant that there was an imbalance in the size of some groups. The 1st year tutee Control Group A for example had nine students compared to seventeen in 1st year tutee Control Group B. In addition to this imbalance, certain groups also contained a low number of students; GEP Intervention Group B for example had only seven members.

Analysis of the mean scores for the MCQ Sets showed that the students achieved higher scores for MCQ Set A than MCQ Set B across all four groups for all tutor and tutee cohorts. The p-values resulting from unpaired t-tests indicated that the difference in scores between MCQ Set A and MCQ Set B for tutor Control Groups A and B, tutor Intervention Groups A and B, total tutee Control Group A and B and total tutee Intervention Group B were statistically significant. These findings therefore strongly suggest that there was an imbalance in the difficulty of the MCQ papers, with MCQ Set B being harder than MCQ Set A. This imbalance between the MCQ papers highlights a key issue of using this method to quantitatively measure improvement in knowledge, which is that it is very challenging to create two MCQ sets consisting of different questions, that are balanced in terms of difficulty. The challenge of creating balanced MCQ sets was understood and discussed during the design phase of this study, but the complexity of the logistics associated with the Canine Clinical Examination Skills PAL intervention and the narrow time frame available to carry out the study meant that short and concise MCQ papers provide the most pragmatic way of performing this assessment.

An additional challenge of performing the MCQ study, also highlighted in this instance, was the difficulty of pitching the questions at the right level, so that any change in performance resulting from experiencing the PAL intervention could be easily identified. The results of a pilot study run with 3rd year students prior to the main study suggested that the initial questions included in the MCQ sets

were too easy and although the questions were modified in response to this, the results showed that students across all cohorts still consistently achieved high scores of between 85% and 100% especially for MCQ Set A. This meant that the band available to measure any improvement was very narrow. The difference in mean score for MCQ Set B between GEP Intervention Group B and GEP Intervention Group A for example was 9.64 which, with the MCQ papers being marked out of 100 with each correct answer awarded 10 points, accounts for less than one question.

If experiencing the PAL intervention resulted in an improvement in the knowledge of the tutor and tutees, the expectation from data analysis would be that students in the Intervention Groups, who have experience PAL prior to completed their second MCQ paper, should have achieved higher scores in the MCQ papers that they sat second compared to those groups that sat the same MCQ paper first and higher scores at the second sitting compared to the Control Groups, who also completing the same MCQ set at the second sitting. Analysis of the change in mean score for each MCQ set between groups that completed the paper at the first sitting and those that completed the paper second, gave mixed and inconclusive results. The change in score data for MCQ set A for example for 4th year tutors shows that both the control and intervention groups, which completed MCQ Set A second, achieved higher scores than the Control and Intervention Groups which completed MCQ Set A at the first sitting, with the Intervention Group achieved a marginally greater change in score than the Control Group. Analysis of the equivalent total tutee and 1st year data also shows that both the Control and Intervention Groups achieved higher mean scores at the second sitting, but in these cases the Control Groups achieved a greater change in mean score than the Intervention Groups. In contrast to these findings, the change in mean score for MCQ Set A for both the GEP Control and Intervention Groups show that they performed worse in the second sitting compared to the first with the Intervention Group performing worse than the Control Group. P-values from unpaired t-tests for all the available comparison group combinations for MCQ Set A data across all cohorts do not indicate any statistically significant difference between data sets.

Similar analysis for difference in mean score for MCQ Set B data shows that the Tutee Intervention Groups outperformed the Control Groups but the 4th Year Tutor Control and Intervention Groups achieved lower scores at the second sitting compared to the first and the Intervention Group did worse than the Control Group. Analysis of the p-values resulting from unpaired t-test run for all group combinations for MCQ Set B suggest that there was a statistically significant difference in mean score between GEP Tutee Intervention Group B (completed MCQ Set B first) and GEP Tutee Intervention Group A (completed MCQ Set B second immediately after the PAL intervention) and between Total Tutee Control Group A (completed MCQ Set B second just before the PAL intervention) and Total Tutee Intervention Group A (completed MCQ Set B second just after the PAL intervention). While these two results fit the expectations of the study, they have to be considered with caution when the small number of individuals in each group and the fact that the change in mean score between data sets was equivalent to less than one MCQ are taken into account.

This study has therefore highlighted a number of challenges associated with using MCQs to quantify any improvement in subject knowledge influenced by experiencing a PAL intervention. The complexity of the logistics associated with the Canine Clinical Examination Skills PAL and timetable restrictions meant that the time windows available to assess any improvement in knowledge associated with the interventions was limited. This meant that an MCQ study, although not an optimal means of assessment due to reasons mention previously, was the most pragmatic way of trying to achieve the set objectives with the time and resources available. The time available for the students to complete each MCQ paper was limited to about 10 minutes so there were restrictions on the number and type of questions that could be included in each paper. A knock on effect of this could be that the MCQ papers were not robust or sensitive enough to enable any improvement in score associated with the PAL intervention to be measured.

A second important factor which limited the effectiveness of the MCQ study, was restrictions associated with ethical considerations. From an ethical standpoint it was important that student involvement in the MCQ study was voluntary and that individuals had the opportunity to withdraw at any point in the process. The knock on effect of this, as mentioned previously, was that less than half the tutor and tutee cohorts took part in the study, some of the groups only contained a small number of individuals and there was imbalance in the number of individuals with in each group. These factors, which restricted the size and structure of the dataset, may have compromised the study with regard to achieving its objectives.

Chapter 4: The Undergraduate Certificate in Veterinary Medical Education (UCVME)

4.1 Introduction

PAL has been used as a teaching methodology at the R(D)SVS for a number of years on an informal basis for the teaching of clinical skills. The success and popularity of the classes amongst staff and students led to formal incorporation of PAL into the veterinary undergraduate curriculum in 2009. Since its introduction, the use of PAL on a more formal basis at the R(D)SVS has grown and there are now a range of classes running across small animal, farm and equine disciplines within the vet school. An often-cited strength of PAL is that it gives students an opportunity to experience teaching and develop the skills and knowledge required to prepare and deliver a teaching session (Wadoodi et al. 2002, Dandavino et al. 2007, Ten Cate et al. 2007). While teaching has been formally recognised by the medical profession as a core skill requirement of medical graduates (Burke et al. 2007, Field et al. 2007, Ross et al. 2007), this is not yet the case in the veterinary profession. The R(D)SVS will however recognise the importance of developing their veterinary undergraduates' teaching and communication skills and therefore decided to build on the success of PAL, by formally recognising the contribution students are already making and the teaching skills and knowledge they are developing, by introducing the UCVME programme.

While achieving certification from the R(D)SVS was seen as a valuable qualification and addition to an undergraduate's CV in its own right, the UCVME organisers decided to align the assessment structure of the certificate with the Higher Education Authority's (HEA) UK Professional Standards Framework (UKPSF) guidelines for achieving Higher Education Academy Associate Fellowship status. The driving force behind this was an additional reason for introducing the UCVME programme, that was to expose the students to the sense of job satisfaction and achievement that can come from teaching and learning and therefore encourage them to explore future careers in academia. HEA Associate Fellowship Status is a very highly regarding qualification within academia and therefore by enabling students to fulfil the majority or requirements needed to achieve this through completion of the UCVME, certification would be an excellent addition to the CV of any veterinary graduate considering a career in academia.

4.2 Methodology

4.2.1 Introduction

Prior to designing and implementing the Undergraduate Certificate in Veterinary Medical Education (UCVME), it was important to establish among both the veterinary undergraduate student body and the wider veterinary profession (i.e. key stakeholders) that the UCVME was a worthwhile concept and a valuable addition to the curriculum vitae of the new veterinary graduate. In order to do this, two questionnaires were produced, one for distribution among the undergraduate student body (Appendix C1) and one for distribution to veterinary professionals (Appendix C2). Both questionnaires were distributed with an attached document summarising the motivation behind the development of the concept, some of the potential benefits for students who might take part and a brief overview of how certification could be achieved (Appendix C3). The undergraduate questionnaire was distributed amongst the whole 1st year (130 students) and GEP (51 students) cohorts at the end of the clinical skills introductory class in December 2013 and amongst approximately one third of the 3rd year cohort (55 out of a cohort of 167) at the end of a clinical reasoning practical in January 2014, to gauge their opinion of the UCVME concept. The veterinary professionals questionnaire was distributed at the end of 2013/start of 2014 by members of the project team to veterinarians working in practice; this took the form of distributing surveys at CPD events at the R(D)SVS and distributing surveys to veterinarians in contact practices. Once the questionnaires had been completed they were returned to members of the project team and collated for further analysis.

As can be seen in Appendix C1, the undergraduate questionnaire asked students if they thought that the UCVME was a good idea and if they would be interested in enrolling. They were also asked to give reasons as to why they would be interested in taking part and to summarise activities that they thought would be suitable for inclusion. A request for some basic demographic information was included at the end of the questionnaire. The student questionnaire was distributed among 1st, GEP and 3rd year veterinary undergraduates.

As can be seen in Appendix C2, the questionnaire generated for the wider veterinary profession asked if the respondent thought that the concept was a good idea with an additional section inviting reasons for their answer. They were also asked if they thought that certification would make new graduates more employable with a section added to enable them to give their reasons for their answer. Finally, the recipients were asked to provide ideas for the skills that undergraduates could develop during their Extra Mural Studies (EMS) to enhance their employability. Results of the undergraduate and professional questionnaire surveys were used to inform subsequent design and development of the UCVME programme.

4.2.2 Objectives

In order to design an effective UCVME programme it was important to establish some specific objectives:

1) Certification achieved through participation in teaching and learning processes at the R(D)SVS and other institutions would be formally recognised by the presentation of a document to successful candidates at the undergraduate veterinary degree graduation ceremony at the end of final year.

2) The UCVME would provide students with a valuable qualification that would encourage participation in activities, which would greatly enhance a CV, especially if considering a postgraduate career in academia.

3) The UCVME would encourage initiative and creativity through the design and implementation of education-related activities.

4) The UCVME would maximise EMS experiences by incorporating education as a theme when planning placements.

5) To be successful UCVME candidates would by default need to practise and develop education skills.

In recognition of the workload placed upon undergraduate veterinary students and to encourage interest and participation in the UCVME programme, a number of additional measures were established at inception to minimise the impact of any additional burden taken on by students embarking on this course:

1) The UCVME would be entirely voluntary and as such, success or failure would have no impact on the veterinary degree course.

2) Documentary evidence required to build a portfolio would be formalised, short and concise and could be completed within a short period of time at the end of each activity.

3) A significant proportion of credits required for certification could be obtained from activities already timetabled within the undergraduate veterinary course.

4) Support would be provided when needed but supervision would be minimal so the amount of effort and application given to the programme would depend entirely on the individual.

4.2.3 Administration

The programme was run by the UCVME Committee composed of members of the R(D)SVS Veterinary Medical Education Division. Advice on the design and implementation of the programme was also sought and received, via input from Gillian Brown, from the accreditation department of the Higher Education Academy (HEA). The Committee was responsible for administrating the programme, assessing the student portfolios and deciding if the requirements for certification have been achieved. In order to make the administration process as clear and efficient as possible and to minimise the workload imposed on candidates, a sequence of concise formalised documents were created for each stage of the process, from registering an idea for an activity through to documenting and reflecting on the experience on completion. An electronic copy of all documents were stored on a bespoke UCVME site on LEARN, a local virtual educational environment.

5) **Activity Proposal Form (Appendix C4) -** An Activity Proposal Form must have been completed for each activity and submitted to the committee for approval prior to the activity taking place. Approval was confirmed via an Email reply. A copy of each completed form must have been included in the portfolio.

6) **Activity Record Form (Appendix C5)** – An Activity Record Form must have been completed for each activity and included in the portfolio. To qualify for certification the form must have been reviewed and signed by the designated supervisor when the activity had taken place.

7) **Activity Log Form (Appendix C6)** – This tabulated form required a row to be filled in for each activity on completion, with the number of credits awarded added to the relevant module column. The log must have been completed in full and displayed as the front page of the UCVME portfolio for final submission.

8) **Planned Activity Log Form (Appendix C7)** – This form was submitted with portfolios to date for the intra-programme reviews in 3rd and 4th year so that assessors on the UCVME Committee could monitor progress and future plans.

4.2.4 Timetable

Students embarked on the UCVME programme at the beginning of the 3rd year and completed portfolios were handed in by 1st May of final year, so that certificates could be awarded at graduation. In order to monitor progress over the course of the programme and provide guidance and feedback, students were also asked to submit their portfolio to date by 1st May of both 3rd and 4th year summarising activities they have completed over the year and outlining what they had planned for the following year. These documents and student progress and certification was overseen by the R(D)SVS UCVME Committee.

A lecture and discussion session introducing the UCVME to 2nd years and GEPs was advertised and held towards the end of the academic year in May. During this session students interested in the programme were asked to complete a Note of Interest Form (Appendix C5) and were then asked to formally enrol via Email at the start of 3rd year (September).

Feedback from the initial lecture and discussion session introducing the programme highlighted that the summer break between 2nd/GEP and 3rd year, when students had no EMS commitments, was a time when a number of students take the opportunity to do some very different and interesting projects, which may have contained educational elements that would have qualify for accreditation. This initial feedback led to the creation of a Pre-enrolment Qualifying Activity Record Form (Appendix C6), which enabled students to formalise the educational elements of these activities and take them forward to the certificate programme.

4.2.5 Course Structure

The UCVME programme was designed with a modular structure similar to the current Continued Professional Development (CPD) certificate courses that veterinary surgeons working in the profession embark on post graduation. The reasons for this were:

1) It is clear, simple and flexible so individuals could tailor their certificate programme to their particular requirements and interests.

2) The modular structure gave the flexibility to the course organisers to change and modify the programme as it grew and evolved through the addition, removal or modification of modules as required.

3) It introduced this structure at undergraduate level so that there was continuity with postgraduate study and therefore through familiarity would help ease the transition from undergraduate to post graduate education, encouraging an ethos of lifelong learning.

The course was divided into 3 modules based on the veterinary skills and knowledge of the recipients of the training/learning modality. Structuring the modules in this way would help the candidates focus and design their activities for their target audience and, by making it certification requirement to include activities from more than one module, candidates would be required to target a range of different audiences thereby enriching their teaching and learning experience.

Module A: Tutees are unskilled in the veterinary field and have limited veterinary knowledge i.e. general public.

Module B: Tutees have a similar level of veterinary skills and knowledge as the tutor i.e. undergraduate peers at vet school.

Module C: Tutees are generally more qualified and have greater veterinary skills, knowledge and experience than the tutor i.e. qualified veterinary professionals, vet school teaching staff.

4.2.6 Assessment

As mentioned above, a key objective of the UCVME programme was to provide students with a valuable qualification, which would greatly enhance a CV, especially if considering a postgraduate career in academia. As a result, the assessment structure of the programme was based on the UK Professional Standards Framework (UKPSF) (Appendix C8) with direct linkage with the Higher Education Academy Associate Fellowship. The HEA is a highly regarded organisation within higher education and achieving Associate Fellow Status is seen as a valuable addition to the CV of any graduate considering a postgraduate career in academia. By structuring the assessment in this way, our aim was that a proportion of candidates who completed the UCVME programme would have the opportunity, if they so wish, to submit a final portfolio aligned to HEA Associate Fellow Status.

4.2.7 General Requirements for UCVME Certification

In order to achieve certification students had to accrue a minimum of 40 credits. There was no upper limit to the number of credits that could be accumulated. The activities were divided into ‘Core’ and ‘Elective’ and a minimum of 20 credits must have been accumulated for each of these elements. Activities included in the final UCVME portfolio must have represented at least two of the three modules (A, B, C) described above. Examples of ‘Core’ and ‘Elective’ activities including credit awards are included in Table 4.1 below.

Table 4.1 Examples of 'Core' and 'Elective' activities including credit awards

TOTAL 40 credits needed (20 Core + 20 Elective)

UCVME 'Core' Activities

Year	Course	Description	Activity	Credits
2/GEP	PCS	UCVME briefing and guidance	Plenary	5
4	PCS	Communication Skills	Participation and peer feedback	5
4	PCS	Peer Assisted Learning, PAL (Canine Clinical Exam)	Plenary, learning plan and delivery	10

UCVME 'Elective' Activities

Year	Course	Description	Credits
3-5	Equine, small animal, Final Year	Large and small animal clinical PAL	5
3-5	SSC2	SSC2 educational research project	20
3-5	Module A Activity	See documentation for examples	5
3-5	Module B Activity	See documentation for examples	5
3-5	Module C Activity	See documentation for examples	5
3-5	VetPALs	Participation, inputs and reflection	10
3-5	Peer Support	Participation, inputs and reflection	10
3-5	Any	Preparation and presentation of educational research project	5
3-5	Any	Preparation, submission and acceptance of paper on educational research	10

A minimum number of 5 credits are awarded for each activity. The UCVME committee may however award more credits for an activity if deemed appropriate.

A maximum of 20 credits for activities can been achieved through clinical PAL.

For modules A, B, C there should be activity in the certificate across at least 2 of these modules

4.2.8 End of Year Feedback Survey

A Survey Monkey questionnaire was distributed via email to the 29 students in the first UCVME cohort in September 2015, to gain opinion and feedback on the first year of the course. The questionnaire was designed to assess how well received the first year of the UCVME programme had been and to collate information that could be used to help formulate ideas as to how the course could be modified and improved for future cohorts. Feedback was also sought and received from Dr Miesbeth Knottenbelt from the University of Edinburgh Institute of Academic Development for an independent external view on the UCVME programme.

4.2.9 Data Analysis

Three spreadsheets were created in Microsoft Excel for the student and veterinary pre-UCVME questionnaires and the end of year 1 feedback questionnaire. The columns in the spreadsheets corresponded to the questions included in the surveys. The responses for each questionnaire were then inputted manually into the spreadsheets.

For the free text questions, columns were created in the spreadsheet summarising the main responses given. If the feedback given in the free text response corresponded to a particular column a figure 1 was inputted in the relevant cell. When the data had been inputted for all the questionnaires the columns were tallied and the totals expressed as a percentage of the total responses to give the figures shown in the charts.

4.2.10 Contribution by NS to the UCVME

The only aspects of the UCVME that were not the work of NS were the initial idea and the suggestion of aligning the programme with the HEA professional standards framework. NS developed the modular structure of the programme, the scoring system and the programme timetable, aligned the programme with the HEA professional standards framework and designed and produced all the documentation templates required to complete the portfolio.

4.3 Results

4.3.1 Introduction

This results section contains a summary of the data collated from the two pre-UCVME questionnaire surveys (Appendices C1 and C2) completed by R(D)SVS undergraduates and veterinary professionals and one feedback questionnaire survey (Survey Monkey) completed by the first UCVME student cohort at the end of their first year of the course.

4.3.2 Results From Veterinary Professionals Pre-UCVME Questionnaire Surveys

Survey Question	Yes		No		Maybe	
	Number	%	Number	%	Number	%
Do you think the UCVME is a good idea?	23	95.8	1	4.2	0	0.0
Do you think certification would make a new graduate more employable?	9	37.5	2	8.3	13	54.2
Would you consider being involved?	10	43.5	1	4.3	12	52.2

Table 4.2 Responses of Veterinary Professionals to 'Yes/No/Maybe' Questions 6 and 7 on Pre-UCVME Survey Questionnaire

A table showing the number and percentage of a total cohort of 24 veterinary professional respondents surveyed, to the 'Yes/No/Maybe' questions 1) 'Do you think the UCVME is a good idea?' 2) 'Do you think certification would make a new graduate more employable?' 3) 'Would you consider being involved?'

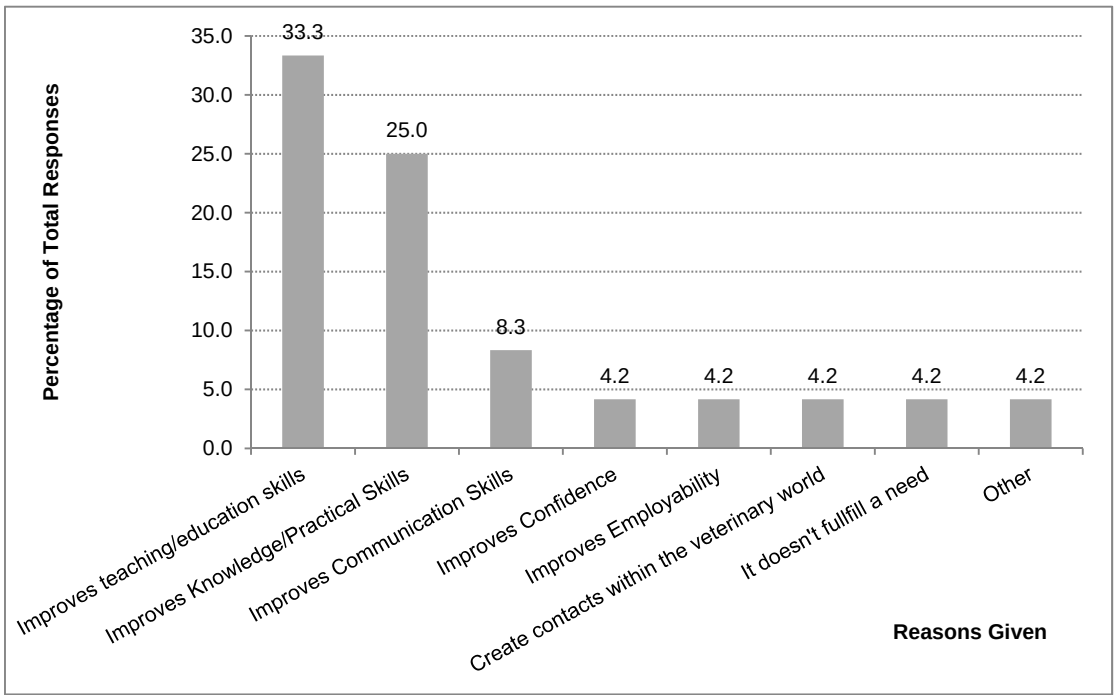


Figure 4.1 A Summary of Free Text Responses Given by Veterinary Professionals To Question 6a in the pre-UCVME Survey Questionnaire

A Chart to show the percentages by summarised category of positive and negative free text responses given by veterinary professionals to the pre-UCVME survey question 'Please give reasons for your answer to the question 'Do you think that the new Undergraduate Certificate in Veterinary Medical Education is a good idea?'

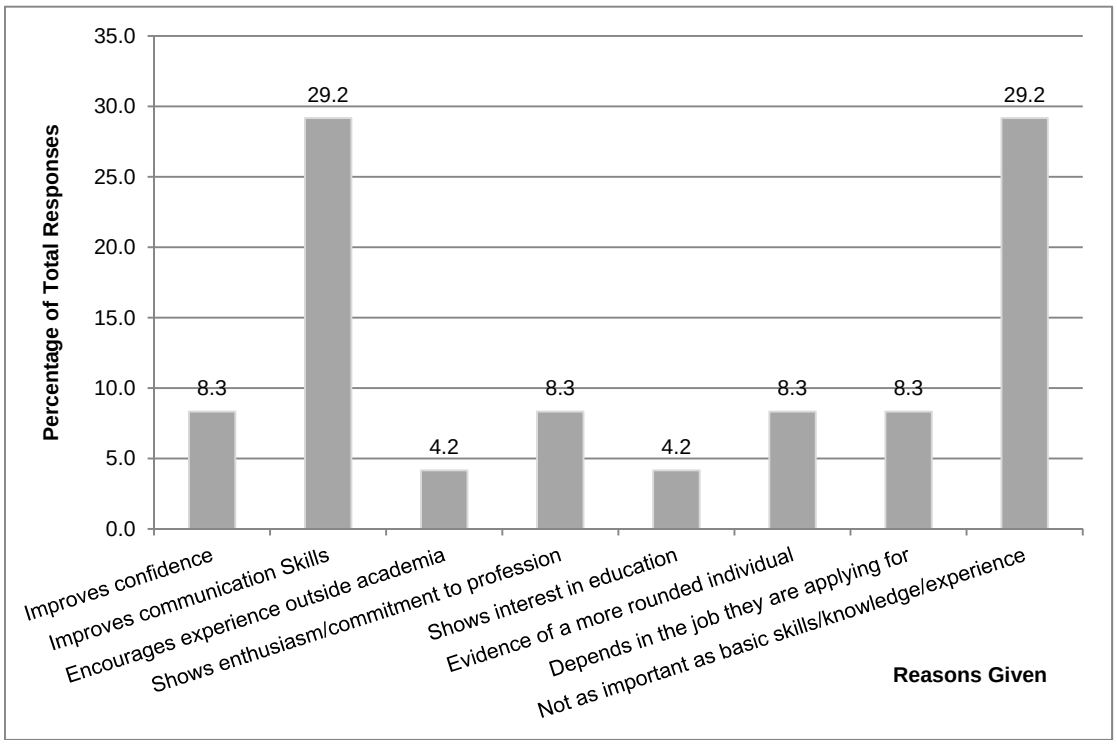


Figure 4.2 A Summary of Free Text Responses Given by Veterinary Professionals To Question 7a in the pre-UCVME Veterinary Professional Survey Questionnaire

A Chart to show the percentages by summarised category of positive and negative free text responses given by veterinary professionals to the pre-UCVME survey question 'Please give reasons for your answer to the question 'Do you think certification would make a new graduate more employable?'

Virtually all veterinary professionals (95.8%) who completed the survey thought that the UCVME was a good idea. (Table 4.2). The most popular reasons given for this were that it would improve the students' teaching/education skills (33.3%) and would also improve their knowledge and practical skills (25%) (Figure 4.1). 37.5% of vets who completed the survey thought that achieving certification would make a new graduate more employable with 54.2% indicating that this might be the case without giving a more positive or negative commitment (Table 4.2). The most popular reason given as to why the programme might improve employability was an improvement in communication skills (29.2%), however the same percentage of respondents (29.2%) indicated that basic practical skills, knowledge and experience were more important considerations than any education/communication skills enhanced by enrolling on the UCVME, when employing a new graduate (Figure 4.2).

4.3.3 Results From Veterinary Students Pre-UCVME Questionnaire Surveys

Cohort	Number of responses by Cohort	Good Idea?				Interested in Enrolling?					
		Yes		No		Yes		No		Maybe	
		Number	%	Number	%	Number	%	Number	%	Number	%
1st Year	50	49	98	1	2	24	48	3	6	23	46
GEP	42	42	100	0	0	24	57.1	2	4.8	16	38.1
3rd Year	47	47	100	0	0	30	63.8	2	4.3	15	31.9

Table 4.3 Responses of R(D)SVS Undergraduate Students to 'Yes/No/Maybe' Questions on Pre-UCVME Student Survey Questionnaire

A table showing the number and percentage of total cohort undergraduate student responses to the pre-UCVME survey 'Yes/No/Maybe' questions 1) 'Do you think the UCVME is a good idea?' 2) 'Would you be interested in enrolling on such a certificate programme?'

Virtually all respondents across all four cohorts surveyed thought that the UCVME was a good idea. A majority of 56.1% of students across the three cohorts surveyed indicated that they would be interested in registering for the UCVME programme. While a majority of students across each individual cohort responded positively, the third years (63.8%) were most interested in enrolling and the first years (48%) the least. While the percentage of students across the cohorts not interested in enrolling for the UCVME was low (5%), nearly two fifths (38.8%) of all students surveyed indicated that they had reservations regarding enrolling on the UCVME by choosing 'Maybe' as their response.

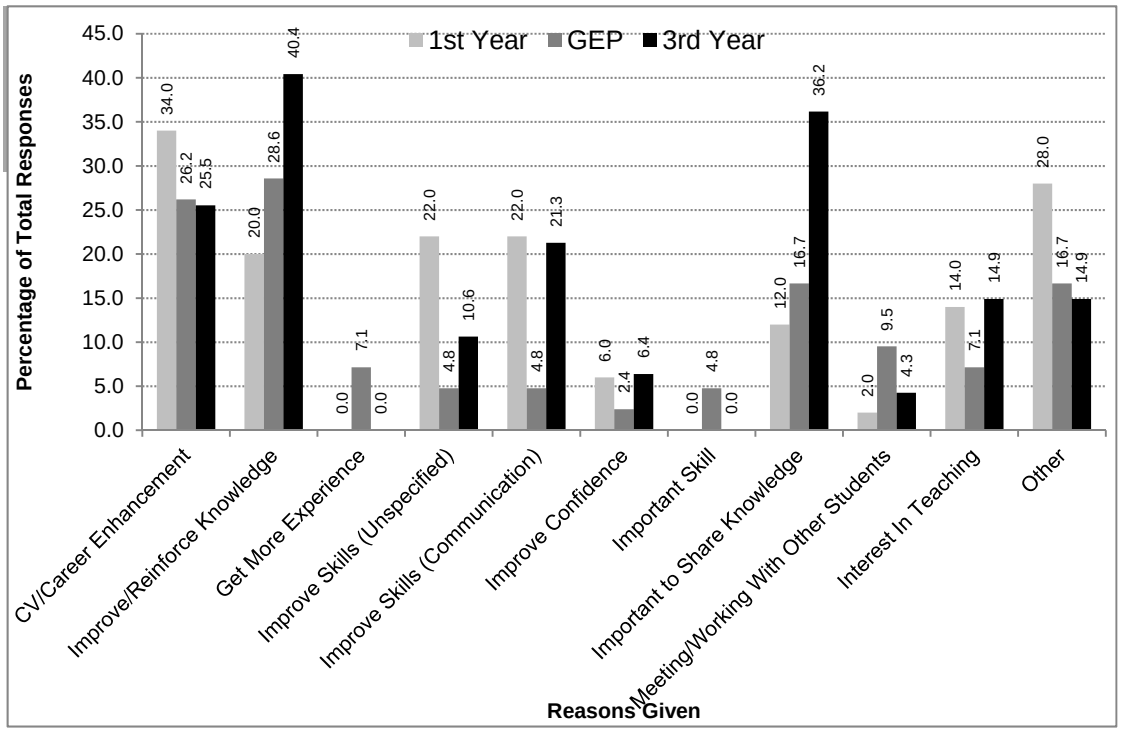


Figure 4.3 A summary of positive free text responses given by veterinary students by cohort to Question 2a in the pre-UCVME Student Survey Questionnaire

A Chart to show the percentages by summarised category of positive free text responses given by veterinary students by cohort, to the pre-UCVME survey question 'Please give reasons for your answer to the question 'Would you be interested in enrolling on such a certificate programme?'

CV/career enhancement (34%), improving communication skills (22%) and the development of other unspecified skills (22%) were the most popular reasons given by 1st year students for considering enrolling on the UCVME programme. improve/reinforce knowledge was the most important reason given by both GEPs (28.6%) and 3rd years (40.4%) but only the fourth most important reason given by 1st years (20%). The second most popular reason given by 3rd years (36.2%) and third most popular by GEPs (16.7%) was the opportunity given by enrolling on the UCVME to share knowledge with others. Similarly to 1st year respondents, improving communication skills (21.3%) was a popular reason given by 3rd year students for considering enrolment, however this was not a very common reason given by GEP students (4.8%). GEP students cited meeting/working with other students (9.5%) as the fourth most popular reason for enrolling whereas this was not in the top five most popular responses given by either 1st or 3rd year students. An interest in teaching only ranked as fifth most popular reason for enrolling on the UCVME for all three cohorts surveyed.

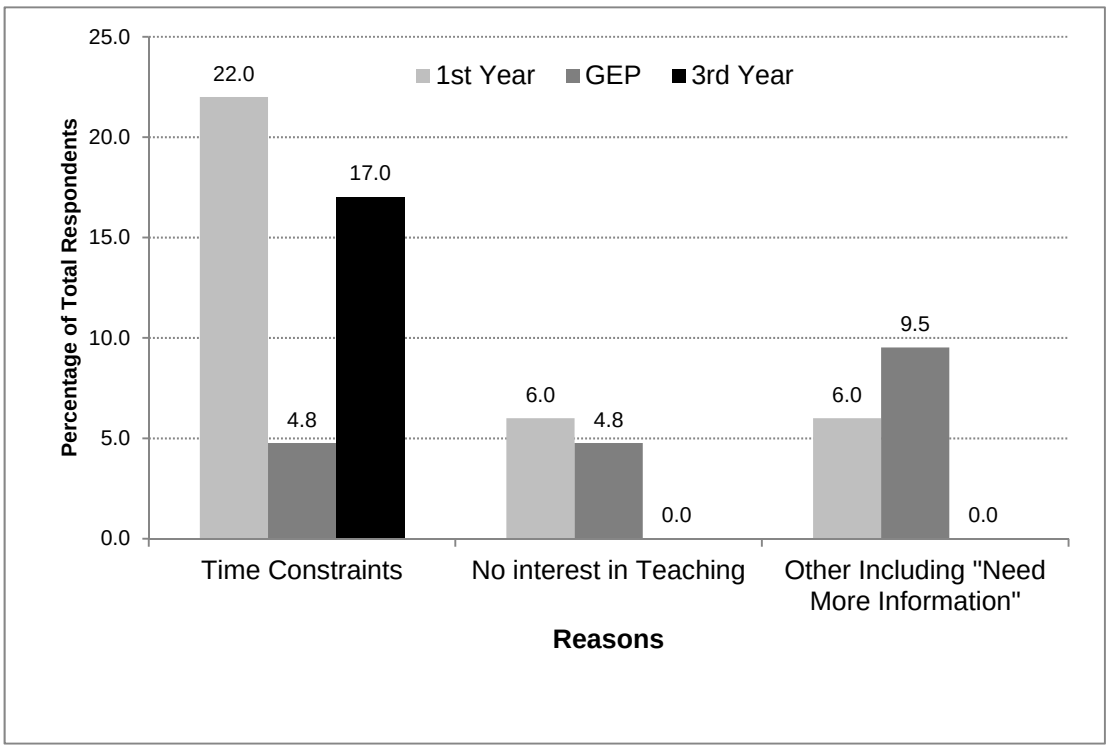


Figure 4.4 A summary of negative free text responses given by veterinary students by cohort to Question 2a in the pre-UCVME Student Survey Questionnaire

A Chart to show the percentages by summarised category of negative free text responses given by veterinary students by cohort, to the pre-UCVME survey question 'Please give reasons for your answer to the question 'Would you be interested in enrolling on such a certificate programme?'

Time constraints was the most popular reason given by both 1st year (22.0%) and 3rd year (17.0%) students for not wanting to enrol on the UCVME programme. 9.5% of GEP students responded by indicating that they would require more information before embarking on the programme.

4.3.4 UCVME Enrolment data for 2014 and 2015 and results collated from the student feedback questionnaire distributed at the end of the first year of the programme in September 2015.

	2014: 3rd Year Cohort = 160		2015: 3rd Year Cohort = 161	
	Number	%	Number	%
Voluntary Briefing Session Attendance	61	38.1	NA	NA
Note of Interest' Submissions	44	27.5	46	28.6
Formal Enrolment on UCVME Programme	30	18.8	43	26.7
Withdrawals	1	0.6	NA	NA

Table 4.4 A summary of enrolment data for the UCVME for the 2014 and 2015 3rd year veterinary undergraduate cohorts

A table to show the number and percentage of R(D)SVS 2014 and 2015 3rd Year veterinary undergraduate cohorts who attended the UCVME briefing session, declared an interest in enrolling on the UCVME programmed, the number of students who formally enrolled and withdrawals from the programme in 2014.

Feedback Statement	Likert Responses: Percentage of Total Respondents					
	SA	A	N	D	SD	NA
I think that the UCVME experience is having a positive impact on my undergraduate career'	58.8	35.3	5.9	0.0	0.0	0.0
'The UCVME experience has stimulated my interest in teaching'	47.1	47.1	5.8	0.0	0.0	0.0
I think that the UCVME experience will have a positive impact on my future career'	52.9	47.1	0.0	0.0	0.0	0.0
I think that the UCVME experience will enhance my Curriculum Vitae (CV)'	58.8	41.2	0.0	0.0	0.0	0.0
'The UCVME experience has made me consider a possible future career in academia'	11.8	35.2	47.1	5.9	0	0.0
'The modular structure of the UCVME works well for me'	11.8	82.4	5.8	0	0.0	0.0

Table 4.5 A table showing the Likert scale responses to statements included in the first year UCVME participants feedback questionnaire

The table shows the Likert scale responses given by UCMVE students who had completed the first year of the programme, to statements included in the feedback questionnaire distributed in September 2015. The figures represent the responses given as a percentage of the total respondents. The column abbreviations represent the follow responses: SA – Strongly Agree, A – Agree, N – Neither Agree or Disagree, D – Disagree, SD – Strongly Disagree.

The Survey Monkey student feedback questionnaire was distributed by email to the 29 students who had completed the first year of the UCVME programme, in September 2015. 17 completed questionnaires were submitted representing a response of 58.6%. 94.1% of respondents strongly agreed or agreed that the UCVME experience had had a positive impact on their undergraduate career. 5.9% had no strong opinion, with no respondents disagreeing or strongly disagreeing with the statement. 94.2% of respondents strongly agreed or agreed that UCVME experience had stimulated an interest in teaching. Only 5.9% of respondents had no opinion either way with regard to this statement, with no individuals disagreeing or strongly disagreeing. All respondents (100%) strongly agreed or agreed that the UCVME will have a positive impact on their future careers and that the experience will enhance their Curriculum Vitae (CV). 47.1% of respondents strongly agreed or agreed that the UCVME career had made them consider a future career in academia, with the same proportion (47.1%) neither agreeing nor disagreeing with this statement. 5.9% of respondents disagreed with the statement. 94.2% of respondents strongly agreed or agreed that the modular structure of the UCVME programme worked well for them, with 5.9% having no opinion either way. No respondents disagreed or strongly disagreed with this statement.

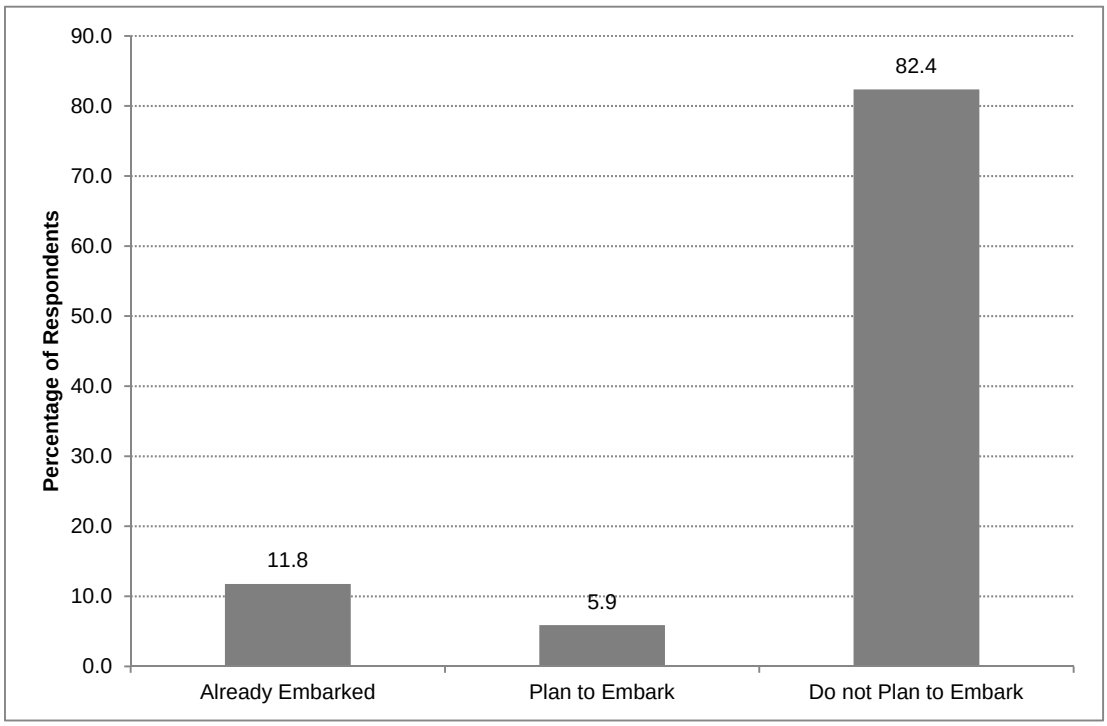


Figure 4.5 A summary of the status of respondents to the UCVME feedback questionnaire with regard to the HEA Associate Fellow application process

A chart showing the responses given as percentage of total respondents to the UCVME feedback questionnaire, to the statement 'Regarding Associate Fellow Status, please select which of the following applies to you:

a) **I am already embarking on the HEA Associate Fellowship application process (Already Embarked).**
b) **I plan to embark on the HEA Associate Fellowship application process in the future (Plan to Embark).**
c) **I do not plan to embark on the HEA Associate Fellowship application process (Do not Plan to Embark).**

While 17.7% of respondents have either already started the application process for an HEA Associate Fellowship or plan to do this in future, the large majority of respondents (82.4%) indicate that they have no plans to apply at this stage. All respondents (100%) indicated that they would recommend the UCVME programme to their colleagues.

I think the UCVME is very organised and easy to follow. I think the portfolios every year are perfect for keeping you on track to complete the certificate.
The staff involved are very helpful and supportive. I know I can go to them answers and advice.
I like the way it recognises what we are already doing. For example I am a vetPAL leader and the reflection helps me improve for future sessions
It is self-guided and the flexibility is appreciated.
The group sessions where we went to Liberton High was a really good experience.
Writing reflections on each activity completed - they are useful to look back on.
Having the different modules as they encourage you to push yourself to try new things.
Not having to do 'extra' activities but receiving acknowledgment for activities already in progress
The certificate compliments the vet course; credit is gained for teaching peers in the course, and extra experience is gained from UCVME activities.
Freedom to choose own activities at your own pace
The Liberton high school activities and the staff support for us organizing our own activities.
It is very easy to complete alongside the rest of the vet med course, it Is not too demanding.
I like that parts of the UCVME are already completed in the curriculum and that staff are very supportive of any extra ideas you have.

Table 4.6 Written feedback given by first year UCVME participants in the feedback survey to the question 'What aspects of the UCVME worked well?'

A table showing the written responses given by first year UCVME participants to the following question included in the feedback survey 'What aspects of the UCVME worked well?'. 13 out of 17 respondents provided an answer with 4 respondents skipping the question.

The only negative experience I've had with the UCVME is having a group for one of the projects that did not contribute to the preparation at all, which made the start of our teaching day very chaotic. It all turned out ok in the end, but I'm not sure if there's a way to keep everyone accountable or to ensure that everyone is in fact doing the work.
More clarity of requirements, forms, deadlines. More teaching opportunities through the school itself.
More detailed explanation on how to fill in the activities table
Maybe some optional classes teaching us on education topics
I'm unsure how it could be improved, but it would be nice if their were more community initiatives for us to get involved in, like the Lothian high school days.
The paperwork and forms to fill in could have more structure to make it seem more organised like a portfolio.
More opportunities to visit schools and do workshops.

Table 4.7 Written feedback given by first year UCVME participants in the feedback survey to the question 'What aspects of the UCVME do you think we could improve?'

A table showing the written responses given by first year UCVME participants to the following question included in the feedback survey 'What aspects of the UCVME do you think we could improve?' 7 out of 17 respondents provided an answer with 10 respondents skipping the question.

I am really enjoying the Certificate experience so far. Thank you for giving us this opportunity.
No
Enjoyed it so far, especially the Liberton high visit!
Finding it really rewarding!
I have enjoyed the opportunities doing the certificate has given me.
I have enjoyed it so far, and look forward I this year.

Table 4.8 Written feedback given by first year UCVME participants in the feedback survey to the question 'Do you have any other comments about the Certificate or your experiences so far?'

A table showing the written responses given by first year UCVME participants to the following question included in the feedback survey 'Do you have any other comments about the Certificate or your experiences so far?' 6 out of 17 respondents provided an answer with 11 respondents skipping the question.

4.4 UCVME Discussion

4.4.1 Pre-UCVME R(D)SVS Veterinary Undergraduate and Veterinary Professional Questionnaires

The overwhelmingly positive response across all four cohorts surveyed, when asked if they thought that the UCVME was a good idea, is very encouraging for a number of reasons. Firstly it suggests that the programme would be perceived as a worthwhile exercise by a range of stakeholders, namely junior students who still have a couple of years of study to consider their options, more senior students who are at the point in their career where they need to make a decision on whether to embark on the programme or not and potential future employers. A strong positive response from qualified vets also suggests that members of the profession understand and value the importance of the development of strong teaching and communication skills as part of an undergraduate veterinary course. This is supported by the fact that improving teaching/education skills (33.3%) was the most popular reason given by veterinary professionals when ask why they thought the UCVME was a good idea. This positive response also indicates to faculty that development of the UCVME programme is potentially a worthwhile investment of time and resources.

An average of 56.1% of students across the three cohorts surveyed indicating that they would be interested in enrolling in the UCVME programme is encouraging because it shows a good level of interest across the student body but also suggested that the final enrollment figures will be manageable with regard to faculty time and resources. It is also in line with one of the initial concepts of the UCVME.

An interesting finding regarding the responses given to enrolment in the programme is that 3rd year students responded more positively (63.8% gave ‘yes’ as a response) than first (48.0%) and GEPs (57.1%). An explanation may be that 3rd years have experienced PAL from a tutee perspective in their junior undergraduate years and therefore have a more positive opinion of this teaching methodology. This explanation may also be supported by the fact that the second most popular reason given by 3rd year students surveyed for wanting to enroll was the importance of sharing knowledge. This was only the third most popular reason given for enrolling by GEPs and seventh most popular reason given by 1st year respondents. The positive response by 3rd years to enrolment also suggest that the 3rd year of the veterinary undergraduate course is the right time for students to start the UCVME programme.

When asked if they would consider enrolling on the programme, nearly two fifths (38.8%) of all students surveyed indicated that they had reservations by choosing ‘Maybe’ as their response. The most popular negative reason given by 1st and 3rd year students for not enrolling on the programme was ‘Time Constraints’, with ‘Need more information’ the most popular negative reason given by

GEPs. These findings supported a key consideration that was taken into account when designing the UCVME programme that measures must be taken to ensure that the impact of any additional burden taken on by students embarking on this course would be kept to a minimum.

When asked if they thought that the UCVME would make new graduates more employable, 37.8% of vets responded positively, 8.3% answered 'No' and over half of those surveyed (54.2%) answered 'Maybe'. These results are encouraging because this more positive than negative judgment given by veterinary professionals was made at a time when the UCVME programme was in its early infancy and therefore is based more on a concept rather than fact, evidence or experience. A large percentage of respondents answering 'Maybe' is also understandable, taking into consideration the timing of the survey, because respondents may have found it difficult to make a clear judgment when evidence relating to the success of failure of the project or experience of the process is lacking.

Over two fifths of vets surveyed (43.5%) answered 'Yes' when asked if they would consider being involved in the UCVME programme, with only 4.3% responding negatively. This is a significant finding because a large proportion of credit for the UCVME programme may be accumulated from activities run while a candidate is on EMS placements in private practice. The success or failure of a task may therefore rely heavily on practice resources and cooperation of staff and clients. It is therefore encouraging to see that members of the profession are willing to be involved and 'buy in' to the UCVME programme. This cooperation and involvement from members of the profession is and will be central to the ongoing success of the UCVME because it will play a central role in keeping the programme relevant, up to date and aligned with changes in the profession as a whole. A good measure of this success will be to see the proportion of respondents move from 'Maybe' (currently 52.2%) to 'Yes' (currently 43.5%) when veterinary professionals are asked if they would consider being involved in the UCVME programme in future surveys.

When asked directly, 37.5% of vets surveyed thought that the certificate would make a new graduate more employable. However, when vets were asked to give reasons why they thought that the UCVME was a good idea, the most popular answers given were 'Improves teaching/education skills' (33.3%) and 'Improves knowledge/practical skills' (25.0%), while only 4.2% of respondents gave 'Improves employability' as an answer. In addition, when asked to give reasons for or against the UCVME making new graduates more employable, the joint first most popular answer given by 29.2% of respondents was that improving employability was 'Not as important as basic skills/knowledge/experience'. These findings therefore suggest that, based on the written information provided with the survey to explain the UCVME concept, the vets included in the survey perceived the programme more as providing a vehicle or opportunity for undergraduates to practice and develop their veterinary skills, knowledge and experience rather than creating more employable individuals.

When the undergraduates surveyed were asked to give reasons why they would be interested in enrolling in the programme, the most popular answer given by 1st year students was 'CV/Career Enhancement' (34.0%). While this was also popular a popular response given by GEPs (26.2%) and 3rd years (25.5%), both these cohorts gave 'Improve/Reinforce Knowledge' (GEP: 28.6%, 3rd year: 40.4%) as the most popular reason. These results therefore suggest that improving employability ranks higher amongst younger, less experienced, junior undergraduates as a reason for enrolling on the UCVME programme where as older more senior students see UCVME enrollment as an opportunity to practice their veterinary skills, knowledge and experience, a view more in line with the veterinary professionals who took part in the survey.

4.4.2 End of Year 1 Student Feedback Questionnaire

Just over half (17) of the candidates who enrolled in the first year of the UCVME in September 2014 (30) completed a questionnaire in September/October 2015, asking for feedback relating to their experiences over the first year of the programme. The results of this feedback survey are encouraging and while changes and modifications will inevitably have to be made, the findings from the feedback are generally in line with the objectives set when designing the programme.

Of the 44 notes of interest submitted following the voluntary briefing session held in May 2014, 30 students, just under one fifth (18.8%) of the 2014 3rd year cohort, formally enrolled on the course, representing a conversion rate of 68.2%. During a review of the candidates portfolios submitted at the end of the year, the members of the organising committee felt that an enrolment of this size was manageable in terms of staff time and resources but that this would have to be closely monitored on an annual basis as more candidates enrolled onto the programme with the passing of each academic year. The importance of this was highlighted by the fact that in 2015 a similar number of notes of interest were submitted (46) compared to the previous year but the conversion rate to formal enrollment had increased to 93.5%, which meant that an additional 13 candidates had formally enrolled compared to the previous year.

When asked if the UCVME had had a positive impact on their undergraduate career 94.1% of respondents strongly agreed or agreed which is very encouraging, especially when taking into account the workload and time constraints of the veterinary undergraduate course. This suggests that the manner in which the programme has been designed and implemented has enabled a key objective set during the initial planning stages to be met, namely that the impact of any additional burden taken on by students embarking on this course must be kept to a minimum. This is supported by the fact that there was only one withdrawal from the programme in the first years and by feedback comments made by students, such as *'Not having to do 'extra' activities but receiving acknowledgment for activities already in progress'* and *'It is very easy to complete alongside the rest of the vet med*

course, it Is not too demanding' in the open response section at the end of the feedback form, asking for comments on what aspects of the UCVME programme worked well. In relation to this, another student also commented that '*The certificate compliments the vet course; credit is gained for teaching peers in the course, and extra experience is gained from UCVME activities',* supporting the view that the UCVME had a positive impact on some veterinary undergraduate careers.

In addition to a positive response to career enhancement at undergraduate level, all respondents (100%) strongly agreed or agreed that the UCVME experience would both enhance their curriculum vitae and have a positive impact on their future careers. 'CV/Career Enhancement' was the most popular reason given by 1st year students and a high-ranking response for both GEPs and 3rd years when asked to give reasons why they would interested in enrolling in the UCVME programme as part of the pre-UCVME survey. This finding from the feedback questionnaire therefore suggests that the UCVME programme is meeting certain expectations of the candidates that have enrolled, which is encouraging.

Whilst the feedback relating to career enhancement at undergraduate level and future careers following graduation was very positive, the response to a statement asking if the UCVME had made the students consider a possible future career in academia was less so. The largest proportion of respondents to this statement (47.1%) said that they neither agreed nor disagreed, with 35.3% agreeing, 11.8% strongly agreeing and 5.9% disagreeing. The UCVME candidates were also asked in the feedback questionnaire their current situation regarding HEA Associate Fellow Status. 11.8% or respondents had already started the application process with 5.9% planning to start the application process in the future. 82.4% of respondents indicated that they had no plans to embark on the HEA Associate Fellow application process. At this point in the process therefore these results suggest that more work needs to be done to encourage students to explore future careers in academia. It will be important and interesting to monitor these responses in the future to see if there are any changes in the students' attitudes towards careers in academia.

Another encouraging finding from the feedback survey, with regard to the overall design and implementation of the UCVME programme, is that 82.4% of respondents agreed and 11.8% strongly agreed with the statement 'The modular structure of the UCVME works well for me'. This positive response was supported by comments made in the feedback questionnaire section 'What aspects of the UCVME worked well?' such as *'Having the different modules as they encourage you to push yourself to try new things', 'The certificate compliments the vet course; credit is gained for teaching peers in the course, and extra experience is gained from UCVME activities'* and '*Freedom to choose own activities at your own pace'*.

A key finding regarding ongoing support from the student body and faculty and longevity of the programme was that all respondents from the feedback survey (100%) indicated that they would

recommend the UCVME programme to their colleagues. This finding is supported by general comments given by students in the section included at the end of the feedback questionnaire, for example *'I am really enjoying the Certificate experience so far. Thank you for giving us this opportunity', 'Finding it really rewarding!'* and '*I have enjoyed the opportunities doing the certificate has given me'.*

It is important to qualify the very positive statistics quoted above by emphasising that 13 out of 30 students who were asked to complete the feedback questionnaire did not respond and therefore there may have been more negative experiences and opinion with regard to the UCVME programme that was not pick up by the feedback survey. In regard to this, the students were asked 'What aspects of the UCVME do you think we could improved?' responses to which included '*More clarity of requirements, forms, deadlines. More teaching opportunities through the school itself', 'Maybe some optional classes teaching us on education topics'* and '*The paperwork and forms to fill in could have more structure to make it seem more organised like a portfolio'*. Negative feedback and suggestions as to how the programme could be improved are vitally important to the ongoing success of the programme because it enables positive changes to be made required for ongoing improvement and development.

Chapter 5 – Final Discussion and Conclusions

The key overarching theme running through both the equine and canine clinical examination skills PAL feedback data and the UCVME feedback questionnaires, is the positive perception from undergraduates of PAL as a teaching methodology and the positive response from undergraduates and members of the profession to the importance of the inclusion of teaching and communication skills training as part of a veterinary undergraduate curriculum. A positive response to PAL as a teaching methodology by both tutor and tutee participants is a common finding across a range of PAL studies described in the published literature (Baillie et al. 2009, Hill et al. 2010, Iwata et al. 2014). Opportunities to practice and develop teaching and communication skills have also been cited as important benefits of PAL interventions in addition to improvements academic skills and knowledge (Baillie et al. 2009, Strand et al. 2013). The positive reaction from veterinary undergraduates to the R(D)SVS equine and canine PAL clinical examination skills classes in these areas therefore validates these specific interventions as a valuable addition to the body of research already published in this area.

5.1 Equine and Canine Clinical Examination Skills PAL Interventions

An often-cited reason for the formal implementation of PAL in a medical or veterinary undergraduate curriculum is to enable the provision of high quality small group teaching with limited staff time and resources (Topping 1996, Nestel et al. 2005, Ten Cate et al. 2007, Baillie et al. 2009). The equine and canine PAL clinical examination skills classes were designed and developed by two faculty academics and are implemented by them on an annual basis with a small team of three to four support staff. During the canine clinical skills classes, 160 1st year and GEP tutees are each given the opportunity to practice and develop their clinical examination skills and knowledge on a live dog for an hour, with more experienced undergraduate colleagues on hand to provide guidance, advice and answer questions. At the same time, 120 4th year tutors are given the opportunity to fine-tune their clinical examination skills and knowledge while also practicing and developing teaching and communication skills. The 4th year tutors, in preparation for the PAL classes, were also given the opportunity to attend a two and a half hour introductory session, designed and implemented by the same two faculty academics, where they receive instruction on how to teach and guidance on the design and delivery of a teaching intervention. When these factors are viewed in conjunction with the positive feedback received from the students, it shows that the R(D)SVS equine and canine clinical examination skills PAL classes are a very good illustration of how PAL can be used to deliver high quality small group teaching to multiple student cohorts, with very efficient use of faculty time and resources. While this example of PAL is efficient with regard to the number of faculty staff involved, successful implementation of such a large and logistically complex intervention requires considerable investment of time and effort by this small number of individuals, which again is another often cited requirement

of a successful PAL intervention (Nestel et al. 2005). An often-cited criticism of the use of PAL in relation to limited staff time and resources, is the ethically questionable practice of replacing staff with students as a solution to financial issues or difficulties with staff recruitment (Ross et al. 2007). An encouraging and important finding from the student feedback in relation to this was that when asked who benefitted most from the PAL interventions, very few students gave 'staff' as a response. This therefore suggests that the students do not perceive that faculty are using PAL in this instance to make financial savings or to make up from limitations in staff time and resources.

The successful execution of PAL requires good planning and course design, clear objectives for the teaching session and subject areas to be covered, and suitable training of peer tutors prior to the intervention (Wadoodi et al. 2002, Nestel et al. 2005, Baillie et al. 2009). While good support of tutors by staff is considered essential (Baillie et al. 2009), student-centred design and implementation of PAL has been shown to exhibit trust in the student body by faculty, encourage and nurture initiative amongst the students involved, maximise the potential for free expression of both tutors and tutees during the intervention and create an informal but highly interactive learning environment (Wadoodi et al. 2002). Analysis of the methodology and results of the R(D)SVS Equine and Canine Clinical Examination PAL shows that these classes are a good model of how an intervention should be designed and implemented because significant staff time and resources has been invested in the design and logistics of the PAL sessions to make sure they run smoothly, the tutors attend an in depth pre-PAL plenary session where they receive training and clear objectives of what they are aiming to achieve and, with staff support, the tutors are also responsible for designing and executing the lesson plan themselves, so the design and implementation of the intervention itself is student-centred.

A current area of debate within the published literature, relating to the design of PAL interventions, is whether tutors should be included on a voluntary or compulsory basis, with pros and cons argued for each of these scenarios. The equine and canine clinical examination skills PAL at the R(D)SVS have the potential to play an important role in advancing research in this area because, to the authors knowledge, it is the only example of two PAL interventions run at the same institution and involving the same cohort of student tutors, which are very similar in terms of design and implementation and subject matter covered, that differ in the fact that tutor involvement is voluntary for one intervention and compulsory for the other. This unique scenario enables comparisons to be made with in a cohort of experienced PAL tutors, between those students that volunteered for the equine classes and those that didn't. It has been suggested in the literature for example that students who volunteer as tutors for PAL interventions tend to be stronger academically than those that don't (Buckley et al. 2007). Future studies could therefore compare the academic performance between the equine volunteers and non-volunteers to see if there was any variation in relation to this. It would also be interesting to investigate whether the clinical examination skills of the equine volunteer tutors, who would have experienced two PAL interventions, were stronger than those students that didn't volunteer and therefore had only experienced the canine PAL intervention.

The logical next step to investigate the qualitative feedback responses given by students in relation to the equine and canine clinical skills PAL interventions would be to hold focus group sessions with tutors and tutees to explore their responses in more detail. An interesting finding for example, from which more detailed information may be obtained by a focus group study, was that there was, in general, no significant difference in the likert responses given by 1st year and GEPs tutees to the feedback questions. This is a useful headline finding for course organisers, especially when viewed in conjunction with the general positivity of the responses given, because it suggests that the course structure and implementation worked for multiple tutee cohorts which ranged widely in terms of age, nationality and general life and academic experience. A focus group study would enable the views of these different demographic groups to be investigated in more detail, providing useful information that could be used to ensure that the PAL sessions continue to satisfy the needs and expectations of students from a range of different backgrounds. These focus group sessions may also provide a valuable opportunity to investigate more general differences between demographic groups with in student cohorts, which in turn could provide importance information regarding the effectiveness and relevance of the veterinary undergraduate curriculum as a whole.

5.2 Canine Clinical Examination Skills PAL MCQ Study

Review of the literature shows that attempts have been made to measure quantitative improvement in students' knowledge following a PAL intervention. The results of these studies have produced mixed results. The body of evidence relating to this is currently limited, so further work is required to expand this area of research (Perkins et al. 2002, Wadoodi et al. 2002, Baillie et al. 2009, Iwata et al. 2014, Salomaki et al. 2014). The reason for running the Multiple Choice Question (MCQ) study alongside the canine clinical examination skills PAL intervention in 2015 was to attempt to quantitatively measure an improvement in canine clinical examination knowledge following the PAL intervention. While the results were inconclusive, the study did highlight the limitations of using MCQs and the complexity and difficulty of quantifying any improvement in knowledge associated with PAL. The study also highlighted a number of options that could be considered for future investigations, such as repeating the MCQ study over a number of years alongside the PAL intervention, to increase the size of the data pool available, enabling a more robust analysis to be performed. Repeating the study would also enable staff to become more knowledgeable with regard to MCQ setting, allowing refinement and modification of the MCQs to provided a more robust and measureable assessment of the student's knowledge.

Two factors, which severely limited the MCQ study, were ethical restrictions and the time constraints associated with running it alongside the PAL intervention. Research has also shown that any improvement in knowledge associated with a teaching intervention tends to be smaller for individuals who had a higher level of knowledge in the first place (Stringer et al. 2011). Since the 4th Year Tutors

are two to three years more experienced than their tutee colleagues, an MCQ study may not be sophisticated enough to measure any improvement in knowledge for this particular cohort. As a result of these factors therefore, the best option may be to move away from the MCQ study and investigate alternative ways of quantifying improvement in knowledge. An alternative for example could be the use of an Objective Structured Clinical Examination (OSCE) methodology. Two compulsory canine clinical examination OSCEs for example, could be put in place as part of the student's formal assessment, one timetabled in the curriculum before the PAL intervention and one at a point after the intervention. This would enable any change in performance associated with the PAL to be measured by comparing the scores between the two assessments. If these OSCEs were part of the student's formal assessment, participation would be compulsory and therefore the limitations experienced as part of the MCQ study due to ethical considerations, would be negated. Holding these assessments at different times in the curriculum to the PAL intervention would also avoid the time pressures and constraints experienced when running the MCQ study alongside the PAL intervention.

5.3 The Undergraduate Certificate in Veterinary Medical Education

While the GMC and similar international organisations, have formally recognised that medical graduates must 'be able to demonstrate appropriate teaching skills' (Nestel et a. 2005, Burke et al. 2007, Field et al. 2007, Ross et al. 2007, Blanco et al. 2014), medical students have reported that there is wide variation in the quality of teaching given by junior doctors and that the teaching provided is often ineffective (Erlich et al. 2014). In addition to this, there is little current evidence of medical schools providing formal education in teaching in medical undergraduate curricula (Dandavino et al. 2007, Erlich et al. 2014). Of the few examples of formal teaching training for medical students describe in the literature, some schools have taken a more theoretical approach and others a more practical approach through the formal inclusion of PAL interventions in undergraduate curricula, but in most cases the programmes last only one or a few days, so little is known about the impact of programmes that run for weeks, months or even years (Erlich et al. 2014). Despite the formal recognition by medical institutions of the importance of medical graduates developing teaching skills, the governing bodies representing the veterinary profession have yet to follow suit. The launch of the R(D)SVS Undergraduate Certificate in Veterinary Medical Education therefore, marks a significant step forward in the provision of teacher training to undergraduate vets and medics for a number of reasons.

Firstly, the commitment of the R(D)SVS to the programme and the fact the achievement of students who complete it is formally recognised through certification, is a statement to the veterinary profession that the institution recognises the importance of veterinary graduates being able to demonstrate appropriate teaching skills. Secondly, to the authors' knowledge, it is the only current example of a formal teaching training programme that runs over two years as opposed to a few days

or weeks, as is the case for the majority of formal courses currently described in the literature. The great advantage of running a programme over this time period is that it gives the students time to learn, practice, reflect and develop strong teaching and communication skills. The UCVME programme also brings together the range of teaching opportunities available to the students at the R(D)SVS and encourages them to use their initiative to develop and practise different aspects and techniques of teaching on a diverse range of audiences. The UCVME therefore provides a much richer and more in depth teaching training experience compared to the relatively short individual courses currently described in the literature. While commitment from the R(D)SVS is central to the success of the UCVME programme, its longevity will be equally dependent on commitment from the veterinary undergraduates and the veterinary profession as a whole. The positive reception from veterinary undergraduates, veterinary professionals and students who had completed the first year of the programme illustrated in the results of this study therefore, is very encouraging at this early stage in the process.

5.4 Final Conclusions

The aim of this project was three fold; 1) To evaluate the perceived effectiveness and popularity of PAL as a methodology for teaching equine and canine clinical examination skills among veterinary undergraduates using qualitative post-intervention feedback data. 2) To quantitatively analyse the results of a multiple choice question (MCQ) study designed to test whether experiencing PAL improved the knowledge of veterinary undergraduates relating to canine clinical examination. 3) To introduce and test the concept of an Undergraduate Certificate in Veterinary Medical Education (UCVME) amongst potential stakeholders and evaluate the programme at the end of it's first year.

Analysis of the feedback data from the equine and canine clinical examination skills PAL interventions suggest that this teaching methodology was popular and perceived as an effective way of communicating this material by both the tutors and tutees. The results of the MCQ study highlight the challenge of trying to quantify any measureable improvement in the knowledge of students that have taken part in an intervention, thereby supporting the theoretical post-positivist perspective where research outcomes can never be totally objective or certain due to the size and complexity of PAL interventions and the range of realities experience by the students taking part. Analysis of the feedback data and the results of the MCQ study will however add to the body of research pertaining to PAL and have identified future areas of research, which may enable a clearer structure to be applied to projects in the future so that more defined and accurate comparisons can be made to explore the effectiveness of PAL as a teaching methodology.

The early results indicate that the UCVME has been well received by the veterinary undergraduates at the R(D)SVS. The team involved in the project are committed to ensuring that the programme

continues to grow and develop and our hope is that projects such as this will play a part in persuading the governing bodies within veterinary medicine to formally recognize the important of developing the teaching skills and knowledge of undergraduate veterinary students.

References

Accreditation Council for Graduate Medical Education (ACGME) (2013). "Common Program Requirements" [Accessed 23rd January 2016]. Available from :https://medicine.umich.edu/sites/default/files/content/downloads/CPRs2013.pdf

Baillie, S., H. Shore, D. Gill and S. A. May (2009). "Introducing peer-assisted learning into a veterinary curriculum: a trial with a simulator." J Vet Med Educ **36**(2): 174-179.

Beard, J. H., P. O'Sullivan, B. J. Palmer, M. Qiu and E. H. Kim (2012). "Peer assisted learning in surgical skills laboratory training: a pilot study." Med Teach **34**(11): 957-959.

Bell, C., S. Rhind, N. Stansbie and N. Hudson (2016) "Getting started with Peer Assisted Learning in a veterinary curriculum." http://www.research.ed.ac.uk/portal/en/publications/getting-started-with-peer-assisted-learning-in-a-veterinary-curriculum(0c61eb8f-609d-42e4-9fb9 ae9463a2adc3)/export.html

Blanco, M. A., A. Maderer, A. Oriel and S. K. Epstein (2014). "How we launched a developmental student-as-teacher (SAT) program for all medical students." Med Teach **36**(5): 385-389.

Blank W. A., H Blankenfeld, R. Vogelman, K. Linde and A. Schneider (2013). "Can neer-peer medical students effectively teach a new curriculum in physical examination?" BMC Medical Education **13**: 165-171.

Brannagan, K. B., A. Dellinger, J. Thomas, D. Mitchell, S. Lewis-Trabeaux and S. Dupre (2013). "Impact of peer teaching on nursing students: perceptions of learning environment, self-efficacy, and knowledge." Nurse Educ Today **33**(11): 1440-1447.

Buckley, S. and J. Zamora (2007). "Effects of participation in a cross year peer tutoring programme in clinical examination skills on volunteer tutors' skills and attitudes towards teachers and teaching." BMC Med Educ **7**: 20.

Burke, J., S. Fayaz, K. Graham, R. Matthew and M. Field (2007). "Peer-assisted learning in the acquisition of clinical skills: a supplementary approach to musculoskeletal system training." Med Teach **29**(6): 577-582.

Cushing, A., S. Abbott, D. Lothian, A. Hall and O. M. Westwood (2011). "Peer feedback as an aid to learning--what do we want? Feedback. When do we want it? Now!" Med Teach **33**(2): e105-112.

Dandavino, M., L. Snell and J. Wiseman (2007). "Why medical students should learn how to teach." Medical Teacher **29**(6): 558-565.

Erlich, D. R. and A. F. Shaughnessy (2014). "Student-teacher education programme (STEP) by step: transforming medical students into competent, confident teachers." Med Teach **36**(4): 322-332.

Field, M., J. M. Burke, D. McAllister and D. M. Lloyd (2007). "Peer-assisted learning: a novel approach to clinical skills learning for medical students." Med Educ **41**(4): 411-418.

GMC (2003) Tomorrow's Doctors: Recommendations on Undergraduate Medical Education (London, General Medical Council).

Glynn, L. G., A. MacFarlane, M. Kelly, P. Cantillon and A. W. Murphy (2006). "Helping each other to learn--a process evaluation of peer assisted learning." BMC Med Educ **6**: 18.

Hill, E., F. Liuzzi and J. Giles (2010). "Peer-assisted learning from three perspectives: student, tutor and co-ordinator." Clin Teach **7**(4): 244-246.

Horneffer, A., U. Fassnacht, W. Oechsner, M. Huber-Lang, T. M. Boeckers and A. Boeckers (2016). "Effect of didactically qualified student tutors on their tutees' academic performance and tutor evaluation in the gross anatomy course." Annals of Anatomy **208**: 170-178.

Hudson N. P. H., Stansbie N. H., Rhind S. M., Handel I. G., Mellanby R. J. and Bell C. E. (2014). "Peer Assisted Learning (PAL) in veterinary clinical training: an increasing role in the Edinburgh Veterinary Undergraduate Curriculum." VetEd 2014

Hudson, N., N. Stansbie, S. Rhind, G. Brown, I. Handel, R. Mellanby and C. Bell (2015). "Recognising and developing students as teachers: Introduction of a novel Undergraduate Certificate in Veterinary Medical Education." Med Teach: 1-3.

Hughes, T. C., Z. Jiwaji, K. Lally, A. Lloyd-Lavery, A. Lota, A. Dale, R. Janas and C. J. Bulstrode (2010). "Advanced Cardiac Resuscitation Evaluation (ACRE): a randomised single-blind controlled trial of peer-led vs. expert-led advanced resuscitation training." Scand J Trauma Resusc Emerg Med **18**: 3.

Illing, J. (2010). "Thinking about research: frameworks, ethics and scholarship." In: Swanwick, T. ed. *Understanding Medical Education: Evidence, Theory and Practice*. Oxford: Wiley-Blackwell, pp. 283-299.

Iwata, K., D. S. Furmedge, A. Sturrock and D. Gill (2014). "Do peer-tutors perform better in examinations? An analysis of medical school final examination results." Med Educ **48**(7): 698-704.

Kam, J. K., J. Tai, R. D. Mitchell, E. Halley and S. Vance (2013). "A vertical study programme for medical students: peer-assisted learning in practice." Med Teach **35**(2): e943-945.

Knobe, M., R. Munker, R. Sellei, M. Holschen, S. Mooij, B. Schmidt-Rohlfing, F. U. Niethard and H. C. Pape (2010). "Peer teaching: a randomised controlled trial using student-teachers to teach musculoskeletal ultrasound." Medical Education 44: 148-155.

Knobe, M., M. Holschen, S. C. Mooij, R. M. Sellei, R. Munker, P. Antony, R. Pfeifer, W. Drescher and H-C. Pape (2012). "Knowledge transfer of spinal manipulation skills by student teachers: a randomised controlled trial." Eur Spinal J **21**: 992-998.

Lachman, N., K. N. Christensen and W. Pawlina (2013). "Anatomy teaching assistants: Facilitating teaching skills for medical students through apprenticeship and mentoring." Med Teach **35**(1): e919-e925.

Lawson McLean, A., C. Saunders, P. P. Velu, J. Iredale, K. Hor and C. D. Russell (2013). "Twelve tips for teachers to encourage student engagement in academic medicine." Med Teach **35**(7): 549-554.

Liaison Committee on Medical Education (LCME) (2015) "Functions and Structure of a Medical School: Standards for Accreditation of Medical Education Programs Leading to the M.D. Degree" [Accessed 14th January 2016] Available from : http://lcme.org/publications/#All

Mabvuure, N. T., J. Rodrigues, A. Cumberworth and M. Mahmud (2013). "Twelve tips for running successful junior doctor-led teaching programmes for medical students." Med Teach **35**(8): 628-632.

McLelland, G., L. McKenna and J. French (2013). "Crossing professional barriers with peer-assisted learning: undergraduate midwifery students teaching undergraduate paramedic students." Nurse Educ Today **33**(7): 724-728.

Mellanby, R. J., S. M. Rhind, C. Bell, D. J. Shaw, J. Gifford, D. Fennell, C. Manser, D. P. Spratt, M. J. Wright, S. Zago and N. P. Hudson (2011). "Perceptions of clients and veterinarians on what attributes constitute 'a good vet'." Vet Rec **168**(23): 616.

Muir, F. and S. Law (2014). "Students' perceptions and experiences of a new "Teaching in Medicine" BMSc intercalated degree programme." Med Teach **36**(5): 403-408.

Nazha, B., R. H. Salloum, A. C. Fahed and M. Nabulsi (2015). "Students' perceptions of peer-organized extra-curricular research course during medical school: a qualitative study." PLoS One **10**(3): e0119375.

Nelson, A. J, S. V. Nelson, A. M. J. Linn, L. E. Raw, H. B. Kildea and A. L. Tonkin (2013). "Tomorrow's educators …today? Implementing near-peer teaching for medical students." Med Teach **35**(2): 156-159.

Nestel, D. and J. Kidd (2005). "Peer assisted learning in patient-centred interviewing: the impact on student tutors." Med Teach **27**(5): 439-444.

Olaussen, A., P. Reddy, S. Irvine and B. Williams (2016). "Peer-assisted learning: time for nomenclature clarification." Med Educ Online **21**: 30974.

Peets, A. D., S. Coderre, B. Wright, D. Jenkins, K. Burak, S. Leskosky and K. McLaughlin (2009). "Involvement in teaching improves learning in medical students: a randomized cross-over study." BMC Med Educ **9**: 55.

Perkins, G. D., J. Hulme and J. F. Bion (2002). "Peer-led resuscitation training for healthcare students: a randomised controlled study." Intensive Care Med **28**(6): 698-700.

Perry, M. E., J. M. Burke, L. Friel and M. Field (2010) "Can training in musculoskeletal examination skills be effectively delivered by undergraduate students as part of the standard curriculum?" Rheumatology **49**: 1756-1761.

Plendl, J., M. Bahramsoltani, O. Gemeinhardt, H. Hunigen, S. Kassmeyer and P. Janczyk (2009). "Active participation instead of passive behaviour opens up new vistas in education of veterinary anatomy and histology." Anat Histol Embryol **38**(5): 355-360.

Ross, M. T. and H. S. Cameron (2007). "Peer assisted learning: a planning and implementation framework: AMEE Guide no. 30." Med Teach **29**(6): 527-545.

Salomaki, T., J. Laakkonen and M. Ruohoniemi (2014). "Students as teachers in an anatomy dissection course." J Vet Med Educ **41**(1): 60-67.

Sengupta, A., A. J. Todd, S. J. Leslie, A. Bagnall, N. A. Boon, K. A. Fox and M. A. Denvir (2007). "Peer-led medical student tutorials using the cardiac simulator 'Harvey'." Med Educ **41**(2): 219.

Smith, K. L., D. J. Petersen, R. Soriano, E. Friedman and L. D. Bensinger (2007). "Training tomorrow's teachers today: a national medical student teaching and leadership retreat." Med Teach **29** (6): 328-334.

Soriano, R. P., B. Blatt, L. Coplit, E. Cichoski Kelly, L. Kosowicz, L. Newman, S. J. Pasquale, R. Pretorius, J. M. Rosen, N. S. Saks, L. Greenberg (2010). "Teaching Medical Students How to Teach: A National Survey of Students-as-teachers Programs in the U. S. Medical Schools." Acad Med **85**: 1725-1731.

Spielman, S., K. Hughes and S. Rhind (2015). "Development, Evaluation, and Evolution of a Peer Support Program in Veterinary Medical Education." J Vet Med Educ **42**(3): 176-183.
Strand, E. B., B. Johnson and J. Thompson (2013). "Peer-assisted communication training: veterinary students as simulated clients and communication skills trainers." J Vet Med Educ **40**(3): 233-241.

Stringer, A. P., C. E. Bell, R. M. Christley, F. Gebreab, G. Tefera, K. Reed, A. Trawford and G. L. Pinchbeck (2011). "A cluster-randomised controlled trial to compare the effectiveness of different

knowledge-transfer interventions for rural working equid users in Ethiopia." Prev Vet Med **100**(2): 90-99.

Ten Cate, O. and S. Durning (2007). "Peer teaching in medical education: twelve reasons to move from theory to practice." Med Teach **29**(6): 591-599.

Topping, K. J. (1996). "The effectiveness of peer tutoring in further and higher education: A typology and review of the literature." Higher Education **32**(3): 321-345.

van Diggele, C., A. Burgess, C. Mellis (2015). "Teacher training programme for medical students: improvements needed." Advances in Medical Education and Practice **6**: 265-270.

Wadoodi, A. and J. R. Crosby (2002). "Twelve tips for peer-assisted learning: a classic concept revisited." Med Teach **24**(3): 241-244.

Walsh, C. M., D. N. Rose, A. Dubrowski, S. C. Ling, L. E. M. Grierson, D. Backstein and H. Carnahan (2011). "Learning in the Simulated Setting: A Comparison of Expert-, Peer-, and Computer-Assisted Learning." Academic Medicine **86**(10): S12-S16.

Weyrich, P., N. Celebi, M. Schrauth, A. Moltner, M. Lammerding-Koppel and C. Nikendei (2009). "Peer-assisted versus faculty staff-led skills laboratory training: a randomised controlled trial." Medical Education **43**: 113-120.

Williams, B and P Reddy (2016). "Does Peer Assisted Learning improve academic performance? A scoping review." Nurse Education Today **42**: 23-29.

BVM&S Final Year Preparation Course 2015

Peer Assisted Learning (PAL) – Lesson Plan

- This lesson plan template should help you to design and deliver your class – **please take it with you to your session (and use it!).**
- After you have delivered your class, please complete the 'group reflection' section at the end of the template.
- Nominate one person in your group to give a hard copy of your fully completed template (lesson plan and group reflection) to the 4th Year Administrator (Dora Christidou or Ben Morse) by **5pm on Monday 11th May 2015.**

PAL GROUP NUMBER	
STUDENT NAMES	
Learning objectives	
List the 1st year/GEP Clinical Skills learning objectives that you have chosen to address during your class:	

Outline of session **(We suggest that you allocate approximate timings to each section)**
a) Setting the Scene ▪ Why are you delivering this teaching? ▪ What 'hooks' will you use to engage learners during your class? ▪ How will you establish the background knowledge and prior experience of your learners?
b) Body of the Class ▪ What will you do? ▪ What will the learners do? ▪ How will you check understanding amongst the learners? ▪ What questions will you ask the learners? ▪ Do you anticipate any areas of difficulty for the learners? If so, how will you address these?

c) Closing the Class ▪ How will you draw the class to a close? ▪ What feedback will you provide to the 1st year students?
Resources required for Session **(Please request any resources that you might need from Catriona.Bell@ed.ac.uk well in advance of your class)**

Group Reflection after the Class
a) What worked well? b) What worked less well? c) What would you do differently next time?

1st YEAR - CLINICAL SKILLS 4
Peer Assisted Learning (PAL) Feedback

- **It would be a great benefit if you could provide the 4th year students with constructive feedback about their class today.**
- **This will also help us to develop and evaluate future classes and teaching strategies.**
- **Your responses will be anonymous, so please circle the appropriate response, and comment as fully as you feel able to.**

4th Year Group Number						
4th Year Student Names (if they introduced themselves to you)						
The pace of the class was appropriate	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
We were given appropriate 'hands-on' time to practice our own clinical skills	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
We were given a clear overview of why clinical skills are important to us at the start of the class	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
What we were expected to do during the class was made clear to us	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
The questions that were asked during the class were clear and understandable	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
The questions that were asked during the class helped me to learn and develop my clinical skills	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
We were given a summary of what we had covered at the end of class	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Not applicable
We were given constructive feedback	Strongly	Agree	Neither	Disagree	Strongly	Not

about our own clinical skills during the class	agree		agree nor disagree		disagree	applicable
The 4th year students were approachable, and I felt comfortable 'asking' or 'answering' questions with them	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Not applicable
I had reservations about being taught by 4th year students before the class	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Not applicable
I would like to be taught by 4th year students again	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Not applicable
I would like to teach other vet students in the future	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Not applicable

Which aspects of the class did you find particularly useful?

Are there any aspects of the class which could be improved?

Who do you think benefits most from this method of teaching (please circle)?

4th year tutors **1st year tutees** **Staff** **Other response (please elaborate below)**

What do you think are the possible advantages and disadvantages of fellow students teaching you?

ADVANTAGES: **DISADVANTAGES:**

Do you have any other comments about the class today?

Finally, a little more about yourself please (This section will not be visible to the 4th year):

Age _____ Gender _____ Nationality _____

Have you completed a previous degree? (please circle): **Yes** **No**

GEP - CLINICAL SKILLS
Peer Assisted Learning (PAL) Feedback

- **It would be a great benefit if you could provide the 4th year students with constructive feedback about their class today.**
- **This will also help us to develop and evaluate future classes and teaching strategies.**
- **Your responses will be anonymous, so please circle the most appropriate response, and comment as fully as you feel able to.**

4th Year Group Number						
4th Year Student Names (if they introduced themselves to you)						
The pace of the class was appropriate	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
We were given appropriate 'hands-on' time to practice our own clinical skills	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
We were given a clear overview of why clinical skills are important to us at the start of the class	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
What we were expected to do during the class was made clear to us	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
The questions that were asked during the class were clear and understandable	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
The questions that were asked during the class helped me to learn and develop my clinical skills	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
We were given a summary of what we had covered at the end of class	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Not applicable
We were given constructive feedback about our own clinical skills during the class	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Not applicable

The 4th year students were approachable, and I felt comfortable asking or answering questions with them	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Not applicable
I had reservations about being taught by 4th year students before the class	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Not applicable
I would like to be taught by 4th year students again	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Not applicable
I would like to teach other vet students in the future	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Not applicable

Which aspects of the class <u>today</u> did you find particularly useful?

Are there any aspects of the class <u>today</u> which could be improved?

Some of you will have been taught by 4th Years during the equine clinical examination classes in Jan/Feb. Was this a helpful experience? Please give reasons for your answer.

Who <u>do you think</u> benefits most from this method of teaching (please circle)?

4th year tutors **GEP tutees** **Staff** **Other response (please elaborate below)**

What <u>do you think</u> are the advantages and disadvantages of fellow students teaching you?

ADVANTAGES: **DISADVANTAGES:**

Do you have any other comments about the class today, or the equine classes in Jan/Feb?

Finally, a little more about yourself please (this section will not be visible to the 4th year):

Age _____ Gender _____ Nationality _____

4th Year - PEER ASSISTED LEARNING (PAL) FEEDBACK

- **This survey refers to the PAL classes with dogs during CLIC, and where applicable the equine clinical exam classes in Jan/Feb if you were involved in them.**
- **Please circle the most appropriate response, and elaborate as fully as you feel able to.**
- **If you did not volunteer for the equine classes in Jan/Feb please go straight to Q2.**

Q1 If you volunteered for the equine classes to what extent do you agree with the statements below? ***"I volunteered to help with the equine classes because…":***						
I wanted to increase my confidence in clinically examining horses	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
I wanted to get more practical handling experience with horses	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
I wanted to develop my teaching/tutoring skills	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
I wanted to improve my own equine clinical examination skills and knowledge	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
I wanted to improve my communication skills	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
I was taught by 4th year earlier in the course, and wanted to do the same myself	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
Any other reasons you volunteered?						
Q2 Did you attend the briefing session for the equine classes? (please circle) **Yes / No** **If yes: Did the briefing influence your decision to be a peer tutor in the equine classes? (please briefly give details)** **Yes / No**						
Q3: If you did not volunteer for the equine classes (that's OK!), but why not?						
Q4: Have you taught before? (please briefly give details)						
Q5: I had reservations about teaching the 1st yr/2nd yr/GEP students before the class	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Not applicable

Please briefly give details of any reservations:						
Q6: I would like to teach other vet students again	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Not applicable
Q7: I felt I was given adequate preparation for teaching my session(s)	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Not applicable
Q8: With regard to the PAL and/or equine classes to what extent do you agree with the statements below? ***"Being a peer tutor…":***						
has increased my confidence in clinically examining animals	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
has improved my own clinical examination skills and knowledge	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
has developed my teaching/tutoring skills	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
has improved my communication skills	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
Will be helpful for my future veterinary career	Strongly agree	Agree	Neither agree or disagree	Disagree	Strongly disagree	Not applicable
Q9 Which aspects of the PAL classes or Equine classes did you find particularly useful?						
Q10 Are there any aspects of these classes which could be improved?						
Q11 Who do you think benefits most from this method of teaching (please circle)? **4th year tutors 1st/2nd/GEP tutees Staff Other response (please elaborate below)**						
Q12 What do you see as the advantages and disadvantages of teaching fellow students? **ADVANTAGES:** **DISADVANTAGES:**						
Q13 Finally, a little more about yourself please: Age _____ Gender _____ Nationality _____ Have you completed a previous degree? Yes/No						

Small Animal Clinical Exam PAL session Multiple Choice Questionnaire – Set A

Examination Number:

Please circle your answers

1) What are the normal canine TPR (Temperature, pulse/heart rate, respiratory rate) reference ranges?

	A	B	C	D
T	**38.0 to 39.0oC**	38.0 to 39.0oC	38.5 to 39.0oC	38.5 to 39.0oC
P	**60 to 120 bpm**	70 to 120 bpm	60 to 120 bpm	70 to 120 bpm
R	**15 to 30 brpm**	15 to 30 brpm	18 to 30 brpm	15 to 30 brpm

2) According to the canine five point body condition scale, what is the body score described below?

'Ribs, spine and pelvic bones not visible but easily palpable, obvious waist, little abdominal fat.'

A:1 B:2 **C:3** D:4 E:5

3) Which option describes the meaning of the acronym 'SOAP'?

A	B	**C**	D
Subjective	Subjective	**Subjective**	Subjective
Observation	Objective	**Objective**	Observation
Access	Access	**Assessment**	Assessment
Plan	Plan	**Plan**	Plan

4) What should be assessed on examination of the eyes in a routine health check consultation without the use of an ophthalmoscope?

A	**B**	C	D
Intra Ocular Pressure	**Eyelid Conformation**	Eyelid Conformation	Eyelid Conformation
The Retina	**Pupil Symmetry**	The Retina	Pupil Symmetry
Colour of Conjunctiva	**Colour of Conjunctiva**	Colour of Conjunctiva	Colour of Conjunctiva
Presence of Ocular Discharge	**Presence of Ocular Discharge**	Intra Ocular Pressure	Intra Ocular Pressure

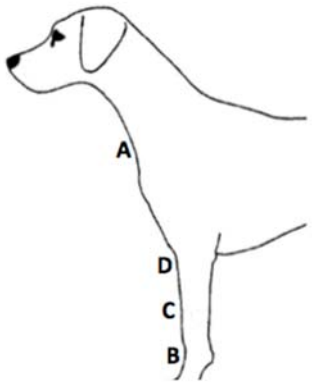
5) This female domestic shorthair stray cat below was brought in to your EMS practice a few days ago and has been kept in to monitor for signs of illness. It has been doing very well so the vet has asked you to perform a final clinical assessment before it is transferred to the local cat shelter. You find all parameters to be within normal limits, so which row (A to D) in the table below represents the most likely findings on your examination?

	Weight	Capillary Refill Time	Temperature	Heart Rate
A	4.5 to 5.5kg	2 secs	38.0 to 39.0oC	140-220bpm
B	**3.5 to 4.5kg**	**<2secs**	**38.0 to 39.0oC**	**160-220bpm**
C	4.5 to 5.5kg	<2 secs	38.5 to 39.0oC	160-220bpm
D	3.5 to 4.5kg	2 secs	38.5 to 39.0oC	140-220bpm

6) Circle the letter (A to D) which correctly identifies the dog breed shown below:

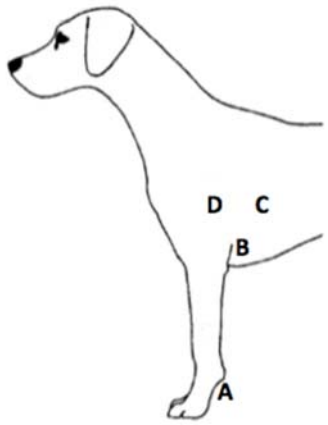
A	**B**	C	D
Pyrenean Mountain Dog	**Newfoundland**	Briard	Neopolitan Mastiff

7) What figure on the diagram represents the raising the cephalic vein for blood sampling‘



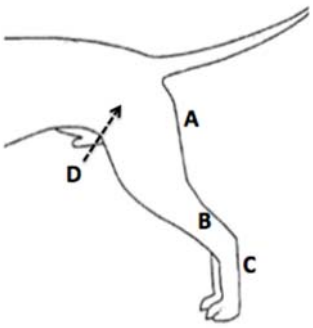
A B C **D**

8) What figure on the diagram best represent beat?



A **B** C D

9) What figure on the diagram represents the location of the femoral pulse?



A B C **D**

10) Kip is a 2 year old, entire male Border Collie brought to the surgery where you are seeing practice for a routine health check and annual vaccination. During the examination the vet informs the owner that Kip’s weight is within the normal range. Circle the letter below (A to D) which most likely corresponds to the weight recorded by the vet:

A	B	C	D
18kg	22kg	13kg	26kg

Small Animal Clinical Exam PAL session Multiple Choice Questionnaire – Set B

Examination Number:

Please circle your answers

1) What are the normal feline TPR (Temperature, pulse/heart rate, respiratory rate) reference ranges?

	A	B	C	**D**
T	38.5 to 39.0oC	38.0 to 39.0oC	38.5 to 39.0oC	**38.0 to 39.0oC**
P	140 to 220 bpm	140 to 220 bpm	160 to 220 bpm	**160 to 220 bpm**
R	15 to 30 brpm	15 to 30 brpm	18 to 30 brpm	**18 to 30 brpm**

2) According to the canine five-point body condition scale, what is the body score described below?

'Ribs, spine and pelvic bones are hardly palpable, waist is absent and heavy abdominal fat deposits are present'

A:1 B:2 C:3 **D:4** E:5

3) Which option describes the signalment of a dog?

A	B	C	**D**
Species	Weight	Breed	**Species**
Breed	Species	Species	**Breed**
Colour	Colour	Sex	**Sex**
Age	Sex	Weight	**Age**

4) During a routine health check, what should be included in a basic oral examination?

A	B	C	D
Capillary Refill Time	Submandibular Lymph nodes	Capillary Refill Time	Capillary Refill Time
Mucous Membrane Colour	Mucous Membrane Colour	Submandibular Lymph nodes	Mucous Membrane Colour
Lips	Lingual Pulse	Lips	Lips
Teeth	Teeth	Teeth	Teeth
Lateral Gums	Lateral Gums	Lateral Gums	Lingual Pulse

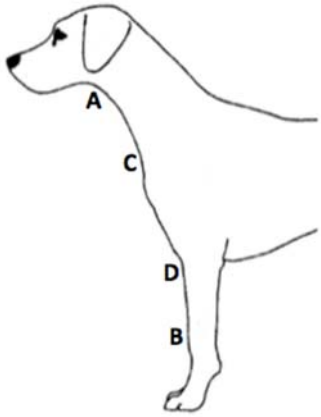
5) During one of your EMS placements working at a neutering clinic you are asked to perform a pre-operative examination of the Labrador retriever pictured below. You find 'vital signs to be within normal limits', so which row (A to D) in the table below represents the most likely findings on clinical examination?

	Body Weight	Capillary Refill Time	Respiratory Rate	Rectal Temperature
A	27 to 38kg	2 secs	15 to 30	38.5 to 39.0oC
B	27 to 38kg	<2 secs	18 to 30	38.0 to 39.0oC
C	**25 to 34kg**	**<2 secs**	**15 to 30**	**38.0 to 39.0oC**
D	25 to 34kg	2 secs	18 to 30	38.5 to 39.0oC

6) Circle the letter (A to D) which correctly identifies the dog breed shown below:

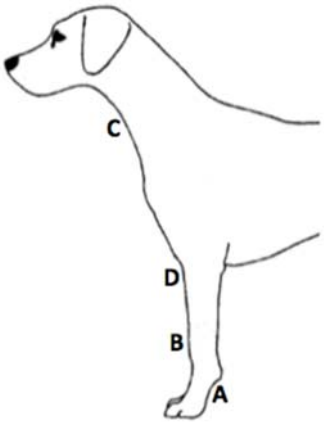
A	B	**C**	D
Bearded Collie	Tibetan Terrier	**Lhasa Apso**	Shih Tzu

7) What figure on the diagram represents the correct thumb position for raising the jugular vein for blood sampling?



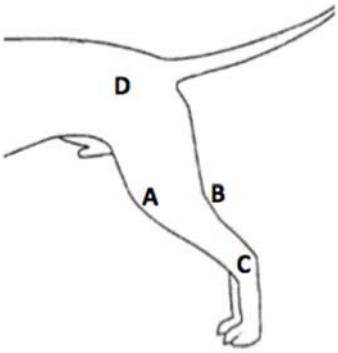
A B **C** D

8) What figure on the diagram represents the location of the carpal digital pulse?



A B C D

9) What figure on the diagram represents the location of the popliteal lymph node



A **B** C D

10) Daisy is a 12 year old, female neutered domestic longhaired cat brought to the surgery where you are seeing practice for a routine health check and annual vaccination. During the examination the vet informs the owner that Daisy's weight is within the normal range. Circle the letter below (A to D) which most likely corresponds to the weight recorded by the vet:

A	B	**C**	D
3.3kg	4.6kg	**3.6kg**	5.0kg

MCQ Consent Form

This consent form is part of the process of informed consent. Please read through the information carefully on this page and if you are happy to proceed, provide the requested information and sign at the bottom of this form.

Please be advised that **your participation in this research is entirely voluntary and is not connected to any course or class and will have no effect on your grades or standing in any course.** There will be no penalty for deciding not to participate in this study.

Title of project:

Development and evaluation of Peer Assisted Learning (PAL) in the veterinary curriculum: A platform for a new Undergraduate Certificate in Veterinary Medical Education.

Purpose of this study:

Peer Assisted Learning is increasingly being used as a method of teaching for veterinary undergraduates. Currently research into the effectiveness of PAL at improving students subject knowledge is very limited so one of the aims of this study is to expand this area of research.

What am I required to do?

You will be required to answer two sets of ten multiple choice questions at two different times with in the Canine Clinical Skills PAL sessions. The times at which students complete the tests and the question sets provided will vary between individuals to ensure that rigorous controls are applied to the study. Your examination number will only be used to match your responses from the two different sets of questions and all matched data will be anonymised once they have been entered into the project database.

What happens to the information I provide?

As mentioned previously, participation is completely voluntary and you are free to discontinue participation at any point during the study. The data collected will be stored in a locked cabinet or on a secure server and will only be accessible by the researcher and designated research personnel. All data will be anonymised and summarized as group information for any presentation or publication of results.

Signed:

_____

Examination Number: _____ **Date:** _____

Appendix B4 – PAL teaching sessions logistics calendar

Thursday 7th May	Tutee						Tutor					
	Year	Class Small Groups	Number in Group	Experimental E or Control C	Question Set (A or B)	When (Before or After PAL Session)	Year	Class Small Groups	Number in Group	Experimental E or Control C	Question Set (A or B)	When (Before or After PAL)
10.00 to 11.30	GEP	GEP 3	12	GEP_E2	A	After	Y4	36, 18, 19		Y4_E2	A	After
11.30 to 13.00	GEP	GEP 4	12	GEP_C2	A	Before	Y4	15, 16, 17		Y4_E2	A	After
14.00 to 15.30	Y1	B4, B5, B6	16	Y1_C1	B	Before	Y4	6, 11, 20		Y4_E2	A	After
15.30 to 17.00	Y1	B1, B2, B3	15	Y1_C1	B	Before	Y4	21, 22, 23		Y4_C2	A	Before

R(D)SVS Undergraduate Certificate in Veterinary Medical Education: Questionnaire

1) Do you think the new Undergraduate Certificate in Veterinary Medical Education is a good idea? (Please circle the appropriate response).

YES NO

2) Would you be interested in enrolling on such a Certificate Programme?

YES NO MAYBE

a) Please give reasons for your answer to question 2

3) Please summarise below ideas for activities that you think would be suitable to include in the Certificate Programme.

4) Which year of the BVM&S degree are you currently in?_____

5) Finally, a little more about yourself please (optional):

Have you completed a previous degree? YES NO

R(D)SVS Undergraduate Certificate in Veterinary Medical Education: Questionnaire

6) Do you think the new Undergraduate Certificate in Veterinary Medical Education is a good idea? (Please circle the appropriate response).

YES NO

a) Please give reasons for your answer to question 1

7) Do you think certification would make a new graduate more employable?

YES NO MAYBE

a) Please give reasons for your answer to question 2

8) Please summarise below ideas for skills that undergraduates could develop while on EMS which would improve their employability.

A New Undergraduate Certificate in Veterinary Medical Education

The Royal (Dick) School of Veterinary Studies, as part of an MSc Research project, is developing a novel *Undergraduate Certificate in Veterinary Medical Education*. This voluntary programme will give our students some recognition of their important role in the teaching and learning processes at the School, fostering the students as partners in education.

Teaching is recognised by the General Medical Council (GMC) as an essential graduate attribute amongst medical students. Whilst this is not formally yet the case in veterinary medicine, we consider educational skills an important day 1 competency for R(D)SVS graduates, who, as new members of the profession will be responsible for educating clients, colleagues and future undergraduate students undertaking extramural studies placements at their practices.

We believe that the certificate programme will offer students tangible recognition for their efforts in terms of developing and delivering education, enhancing their Curriculum Vitae thereby making them more employable as new veterinary graduates.

Certification will be achieved by the completion of a range of teaching and learning activities designed and led by the student. Assessment and output could include an assessed report of the activity and preparation of an education research abstract. A Certificate Project Team will be established to run the programme, assess the student portfolios and decided if the certification requirements have been achieved.

Included below are examples of the type activities that could be included in the certificate programme:

- Developing workshops for widening participation events and school visits
- Science Festivals
- Client education in practice (e.g. pony club talks, puppy evenings)
- Outreach activities with animal charities in the Developing World.
- Online course tutoring on MOOCs (Massive Open Online Courses)
- Peer assisted learning student support initiatives (Senior undergraduate students teaching junior colleagues)
- Undergraduate Peer Support Systems

As a member of the veterinary profession we would greatly value your opinion of the Undergraduate Certificate in Veterinary Medical Education and therefore ask if you could spare a moment to complete the attached short questionnaire.

Thank you very much for helping us with this project.

DICK VET Undergraduate Certificate in Veterinary Medical Education: Activity Proposal Form

An Activity Proposal Form must be completed for each activity and Emailed to DickVetCert@ed.ac.uk for approval prior to the activity taking place. Approval will be confirmed via an Email reply. Please keep a copy of each completed form for your records and portfolio.

NAME	**DATE**
Description of Activity (Focus on education related components)	
When will the activity take place?	
Location	
Name of designated supervisor	
Position of supervisor	
Certificate Module that activity corresponds to	
Proposed number of credits awarded for activity	

DICK VET Undergraduate Certificate in Veterinary Medical Education: Activity Record Form

A Record Form must be completed for each activity and included in your UCVME portfolio. For the activity to qualify for the Certificate the completed form must be review and signed by the designated supervisor.

NAME	**DATE**
Summary of Activity (Focus on education related components)	
What has gone well (why?)	

What could be improved (why?)	
SIGNATURE	**DATE**
Supervisor Feedback (Optional)	
SUPERVISOR NAME (Required)	**DATE**
SUPERVISOR SIGNATURE (Required)	

CREDIT POINTS AWARDED	

DICK VET Undergraduate Certificate in Veterinary Medical Education: Activity Log

Please fill in a row in the table below for each activity on completion. The number of credits awarded for the activity should be added to the relevant module column. Use the Activity Log Continuation Form if your activity entries exceed the number of rows included on this page.

This page must be completed in full and displayed on the front of your UCVME portfolio. Activity Log Continuation Forms should be filed behind this page in the portfolio.

NAME (Block Capitals)……

YEAR OF STUDY……..

ACTIVITY	MODULE A	MODULE B	MODULE C
TOTAL PAGE MODULE CREDITS			
TOTAL PAGE CREDITS			
TOTAL PORTFOLIO MODULE CREDITS			
TOTAL PORTFOLIO CREDITS			

DICK VET Undergraduate Certificate in Veterinary Medical Education: Planned Activity Log

Please fill in a row in the table below for activities planned for next year. The number of credits proposed for the activity should be added to the relevant module column. Use the Planned Activity Log Continuation Form if your activity entries exceed the number of rows included on this page.

Planned Activity Log Forms must be submitted with the portfolio to date by 1st May in 3rd and 4th year so that progress can be monitored.

NAME (Block Capitals)……..

YEAR OF STUDY……..

ACTIVITIES PLANNED FOR THIS YEAR	MODULE A	MODULE B	MODULE C
TOTAL PAGE MODULE CREDITS			
TOTAL PAGE CREDITS			

PAGE ___ OF _

Appendix C8 The UK Professional Standards Framework Summary

The UK Professional Standards Framework consists of three dimensions: Areas of Activity, Core Knowledge and Professional Values each of which consists of a number of elements:

1) Areas of Activity

A1 Design and plan learning activities and/or programmes of study.

A2 Teach and/or support learning.

A3 Assess and give feedback to learners.

A4 Develop effective learning environments and approaches to student support and guidance.

A5 Engage in continuing professional development in subjects/disciplines and their pedagogy, incorporating research, scholarship and the evaluation of professional practices.

2) Core Knowledge

K1 The subject material.

K2 Appropriate methods for teaching and learning in the subject area and at the level of the academic programme.

K3 How students learn, both generally and within their subject/ disciplinary area(s).

K4 The use and value of appropriate learning technologies.

K5 Methods for evaluating the effectiveness of teaching.

K6 The implications of quality assurance and quality enhancement for academic and professional practice with a particular focus on teaching.

3) Professional Values

V1 Respect individual learners and diverse learning communities.

V2 Promote participation in higher education and equality of opportunity for learners.

V3 Use evidence-informed approaches and the outcomes from research, scholarship and continuing professional development.

V4 Acknowledge the wider context in which higher education operates recognising the implications for professional practice.

In order to achieve HEA Associate Fellow Status candidates must demonstrate an understanding of specific aspects of effective teaching, learning support methods and student learning. Individuals should be able to provide evidence of:

I. Successful engagement with at least two of the five Areas of Activity

II. Successful engagement in appropriate teaching and practices related to these Areas of Activity

III. Appropriate Core Knowledge and understanding of at least K1 and K2

IV. A commitment to appropriate Professional Values in facilitating others' learning

V. Relevant professional practices, subject and pedagogic research and/or scholarship within the above activities

VI. Successful engagement, where appropriate, in professional development activity related to teaching, learning and assessment responsibilities

In order to link the UCVME with the HEA Professional Standards Framework, students must have ensured that their overall portfolio of activities addressed each of seven points above so that it was in line with Associate Fellow Status.