


Acquisition of pedagogical knowledge by instructors of veterinary medicine

**Author:**Jacob M. Shivley¹ **Affiliation:**

¹Department of Clinical Sciences, College of Veterinary Medicine, Mississippi State University, United States

Corresponding author:

Jacob Shivley,
j.shivley@msstate.edu

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Background: When practitioners of veterinary medicine enter academia as faculty or clinical instructors, they are asked to perform research, provide service and outreach, and educate students, yet the teaching component is a struggle for many. It has been posited that academic clinicians develop a teaching style similar to those they observed while in school but this has not been confirmed with empirical evidence.

Aim: The aim of this research was to determine how veterinary instructors obtained pedagogical knowledge prior to their faculty appointment.

Setting: The sample consisted of veterinary faculty at a college of veterinary medicine from the southeastern United States. The land-grant university that the veterinary school is associated with is one of only a few schools to earn both research and community engagement rankings from the Carnegie Foundation for the Advancement of Teaching.

Methods: Online surveys were administered to a stratified sample of veterinary faculty and instructors. A mixed-methods approach was utilised to collect and analyse both close-ended and open-ended data. A coding process provided labels for emerging themes, concepts and examples and each research question was answered with descriptive detail.

Results: Descriptive results showed that most instructors (93%) did not receive formal teacher training but derived their pedagogical knowledge from role models prior to teaching. Many faculty members (70%) attended university-sponsored workshops offered by their institutions to build upon and improve their teaching skills.

Conclusion: Overarching themes reflected observational learning *in situ* and a general emphasis on non-cognitive skill development, particularly regarding interpersonal skills.

Introduction

Veterinarians are trained to be clinicians and they are required to be skilled in medical diagnostic procedures, client communication skills and surgical techniques (AVMA 2015; Hill et al. 2012). These doctors learn basic and applied sciences for a multitude of species and are taught complex problem-solving skills (Creevy et al. 2017). However, when veterinarians enter academia as faculty, they are expected to perform research, provide community service and outreach, and educate veterinary students (Glicken 2004). A potential problem for many veterinary faculty is the non-traditional teaching component of their appointment (Bell 2013; Glicken 2004; Magnier et al. 2014; Smith & Lane 2015). It is a commonly held belief that many teachers, including veterinary educators, are not classically trained in pedagogy or educational psychology theory (Creevy et al. 2017; Dolby & Litster 2015; Hashizume et al. 2016; Hofmeister & McCullick 2016; Lane & Strand 2008); however, this has not been empirically demonstrated. Furthermore, there is a need in the veterinary education literature to describe how veterinary instructors obtain pedagogical knowledge. The purpose of this study was to determine the following:

- How do veterinary faculty obtain knowledge regarding effective instructional strategies?
- Who do veterinary faculty source their knowledge from regarding instructional strategies?
- What types of instructional strategies do veterinary faculty obtain from their knowledge sources?

The information obtained from this study should lead to suggestions and improvements for current veterinary teacher development strategies.

Literature review

Veterinary educators

The lack of formal pedagogical education for medical faculty is not a problem unique to the veterinary field (Bing-You et al. 2017; Wilkerson & Irby 1998). Jason and Westberg (1982) found

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that most medical school faculty had no formal teacher preparation. When seeking to answer how clinical teachers in human medicine acquired knowledge about teaching, Irby (1994) found that they sourced knowledge by observing teachers when they were learners. This observational emulation suggests that role models are a vital key for clinical teachers who have had no formal training in teaching. This can be a slow and arduous process, often involving experimentation and reflection to find what works and what fails (Wilkerson & Irby 1998). Medical teacher education has since grown to include faculty development initiatives and enhanced learning curriculum (Steinert et al. 2016; Strand et al. 2015), yet sourcing pedagogical knowledge for the medical teacher is still a challenge for clinical training environments (Denton et al. 2015). When describing pedagogical concepts that must be mastered by clinical teaching faculty, Irby (2014) listed knowledge of pedagogy and learners, and knowledge integrated in teaching scripts, as foundational. Finally, Chen et al. (2016) concluded that medical faculty developed skills to teach multi-level learners while on the job and that a developmental approach during their appointment accounted for acquiring this pedagogical knowledge. For veterinary medicine, it has been posited that academic clinicians develop a teaching style similar to those they observed while in school (Smith & Lane 2015), but this has not yet been confirmed with empirical evidence. This observational learning could also explain how veterinary educators obtain pedagogical knowledge, but the need to ask these questions remains.

Teachers in other disciplines piece together the knowledge needed to become good teachers in similar ways. Research has shown that nurse educators learn on the job and use mentors in discovering how to effectively teach (Gardner 2014). Ironside, McNelis and Ebright (2014) discovered that nurses in clinical education continue teaching the way that they were taught, which included a focus on memorisation of medical knowledge, time management skills and completing medical records. These disparities highlighted in nursing education are also found in other fields. Interestingly, even teacher educators describe gaps in the development of teaching skills and acquiring pedagogies for educating student teachers. These teacher educators were expected by their professors to learn on site, but they eventually depended on their previous experiences while in school as classroom teachers (Goodwin et al. 2014).

A recurring theme found by researchers is the need for improving teaching practices in higher education through faculty development programmes, but how these programmes should be constructed is a matter of debate (Devlin & Samarawickrema 2010; Glicken 2004; Huston & Weaver 2008; Peluso & Hafler 2011; Sunal et al. 2001). Wilkerson and Irby (1998) suggested that medical school comprehensive faculty development programmes include professional, instructional, leadership and organisational development, and that teaching skills are separate from expertise in the educator's field. Peer coaching has been advocated as a teacher development strategy, particularly for

the older, more experienced faculty member (Huston & Weaver 2008). This approach focuses on collaborative, reflective learning strategies with equally experienced faculty members who meet to discuss and question the problems faced at their levels. It also advocates for the experienced faculty to mentor junior faculty.

Sunal et al. (2001) explored a series of faculty development programmes and studied why faculty members may be inhibited in their effort to become more effective teachers. They suggested that personal efficacy is valued above teacher efficacy. Personal efficacy was defined as 'a faculty member's beliefs about his or her ability to facilitate student potential learning' and teacher efficacy was defined as 'a faculty member's belief about their own teaching ability' (p. 251). Low personal efficacy results in a teacher believing that his or her students will not learn regardless of what the teacher does in that course. Low teacher efficacy results in a teacher believing that because of his or her poor teaching skills, he or she cannot successfully teach the students. Faculty members with higher personal efficacy are more likely to effect change in teaching and instructional strategies. Positive teacher development may not occur unless the educators experience dissatisfaction with their current personal concepts of teaching (Steinert et al. 2016; Strand et al. 2015; Sunal et al. 2001).

Clinical teachers share traits with effective teachers (Smith & Lane 2015). It is beyond the scope of this article to provide a complete review of the literature on what constitutes an effective or successful teacher. However, in reviewing the literature, there are a few salient points worth mentioning. Often, the different roles of a clinical educator cannot be accomplished by one person, and, in fact, clinical education may take a whole team. Clinical teachers have to take their roles beyond that of a role model or mentor, and also have to be the information provider, the case facilitator, the assessor of the learner, the course planner and the resource developer (Harden & Crosby 2000). Furthermore, excellent clinical teaching goes beyond ordinary teaching (Sutkin et al. 2008). Non-cognitive characteristics, such as enthusiasm, relationship skills and the ability to inspire, support, actively involve and communicate with students, dominate the themes of superior clinical teaching. These activities promote an emotional component and a connection with students, which transcends the construction of biomedical knowledge. These traits may be inherent in the excellent teacher, and may not be easily taught in formal teacher development protocols. However, formal educational strategies are still advocated for enhancing the skills of the clinical teacher. Thinking aloud, role modelling, reflection and the guided thinking process, deconstructing concrete experiences and providing the opportunity for active practice and timely feedback have all been identified as necessary for veterinary clinical educators (Smith & Lane 2015). An ethnographic case study of veterinarians in clinical teaching found that the effective educator demonstrated a reflective approach to clinical teaching (Magnier et al. 2014). These teachers sought to provide a challenging yet safe learning environment, while establishing rapport with learners.

At the time of submission of this article, studies on veterinary educators' formal teacher education prior to their faculty appointment or how veterinary faculty members pieced together the knowledge needed to become teachers were not found. Based on the literature review, it was hypothesised that most veterinary faculty had limited to no formal training in teaching practices prior to their academic appointments. The information obtained will fill the knowledge gap regarding how veterinary faculty members obtain pedagogical knowledge and should lead to suggestions and improvements for current veterinary teacher development strategies.

Methods

Conceptual framework

The educational psychology theory that the project can be rooted in is situated cognition (Brown, Collins & Duguid 1989; Lave & Wenger 1991). This theory, also known as situated learning, could potentially explain how veterinary faculty members have derived a large portion of their education background from their communities and interactions in everyday life, from the collections of people and events they were influenced by while in veterinary school or other social settings. In medical education, those that influence this type of learning could be other students, patients, clinical instructors or environmental settings (Young et al. 2014).

This type of learning can often be described as unintentional. As it is hypothesised that most veterinary faculty will not have formal educational backgrounds, they are likely to use their experiences with previous educators and combine them with current mentoring from senior faculty to be successful. To this point, cognitive apprenticeship as described by Collins et al. (1991) likely will play a role. In this apprenticeship, the novice authentically learns from an expert who passes down traditions and methods. This is a form of sociocultural learning and can be embedded in an academic setting, within the workplace or within medical education (Lyons et al. 2016). In the context of this study, this theory could also help explain how junior faculty could improve their teaching through relationships with expert teachers in their respective fields (Collins et al. 1991; Stalmeijer 2015).

Procedures

A mixed-methods approach was used to collect and analyse both close- and open-ended data. Qualitative methods that have been successfully employed in the past were used to establish the credibility of this study (Creswell 2013; Shenton 2004). Honesty was highly valued by allowing participants to decline the survey process, encouraging them to be frank and open in their answers, and letting participants withdraw from the research process at any time. Open- and close-ended questions allowed a broader explanation of the research questions. This helped the participants to clarify some of the survey responses and provide richer information. To establish transferability and dependability, transparency was highly

valued and the context of the results of the study was made available. This included the number of participants involved, the data collection methods employed and the time of the data collection.

All participants were informed of the scope of the study and individual unsigned consent was obtained. There were no consequences for those who declined to participate. Instructors who were recruited in person received an unsigned consent document for personal records, which included a statement indicating informed consent and a brief description of the study's purpose and procedures. Instructors who were recruited by email received another version of the consent document which provided the same information as mentioned above.

Survey instrument

The *Pedagogical Knowledge Acquisition Survey-Faculty* (PKAS-F) (Online Appendix 1) was created in the fall of 2016 for the collection of data among veterinary faculty and it arose from multiple discussions and literature reviews during the author's educational psychology class. It was designed to answer the three research questions in order to fill the gap in the knowledge of veterinary educators. Content was checked by an assistant professor of educational psychology at the institution where the survey was delivered to ensure appropriate organisation and presentation. The content was organised to first capture demographic information, and then subheadings were used to group questions into (1) teacher education training prior to becoming veterinary faculty, (2) teacher education since becoming veterinary faculty, (3) desire to learn, (4) formal teacher education, (5) influences and (6) teaching ability. Close-ended yes/no questions were utilised to capture answers without ambiguity, but were then followed with open-ended questions to develop a richer data set. Where appropriate, a Likert scale was used instead of yes/no responses in order to obtain richer data. The survey was intended to be completed in 30 min or less and was designed to lead veterinary faculty through a self-reflection process. Only the questions that captured information needed to answer the research questions were analysed. This survey was distributed to all consenting participants via an online survey engine. Upon completion, the researchers gathered all data from the survey company. Corresponding items on the PKAS-F were mapped to the research questions (Table 1).

Participants and context

Participants were recruited for the study in the fall of 2016 based on publicly shared online information that indicated the individual's position as an instructional faculty member at a college of veterinary medicine in the southeastern United States. Email correspondence was used to recruit and secure consent from the participants. The recruitment email served as a disclosure of information about the study to potential participants, and was structured in a way that allowed for unsigned consent.

TABLE 1: Research questions mapped to items on survey instrument, Pedagogical Knowledge Acquisition Survey–Faculty.

Research questions	Corresponding items (PKAS-F)
How do veterinary faculty obtain knowledge regarding effective instructional strategies?	9, 10, 13, 14
Who do veterinary faculty source their knowledge from regarding instructional strategies?	24, 26, 27, 28
What types of instructional strategies do veterinary faculty obtain from their knowledge sources?	11, 12, 25
Other questions answered	
Do veterinary instructors have a continued desire to, or believe they can, learn more and improve their teaching instruction and pedagogical knowledge?	3, 17, 31, 32
Demographic information	1, 2, 3, 4, 5, 6

PKAS-F, Pedagogical Knowledge Acquisition Survey–Faculty.

The sample consisted of veterinary faculty ($n = 29$) from a southeastern university college of veterinary medicine. A stratified sampling technique was used to capture data from different subgroups of instructional faculty (i.e. clinical instructor [$n = 4$], assistant professor [$n = 5$], associate professor [$n = 9$] and professor [$n = 11$]), all teaching in veterinary medicine. It was anticipated that sampling from a single university would not be problematic when considering that instructional faculty had arrived at their current positions with highly varied backgrounds and experiences. The land-grant university that the veterinary school is associated with is one of only a few schools to earn both research and community engagement rankings from the Carnegie Foundation for the Advancement of Teaching. The college of veterinary medicine awards Doctor of Veterinary Medicine (DVM) degrees, master's degrees and Doctor of Philosophy degrees. It has been fully accredited by the American Veterinary Medical Association since 1981. The DVM degree is a 4-year curriculum that is composed of 2 years of classroom and laboratory work and 2 years of clinical education, which is a uniquely innovative approach in veterinary medical education. The clinical rotations vary from 4 to 8 weeks, with an emphasis on skill acquisition and technical competency. Observational, passive and experiential learning all play important roles in the clinical rotations. Clinical faculty along with residents and interns are responsible for delivering the learning experiences in the final 2 years of clinical education.

Data analysis

Codes emerged from inductive and deductive thematic analyses. Memorable quotes were noted and summaries were constructed including the main themes, points and insights expressed by each participant. Next, a coding process provided labels for emerging themes, concepts and examples (Table 2). After comparing and contrasting the various themes and concepts, each research question was answered with descriptive detail (Rubin & Rubin 2012).

Quantitative analysis was conducted using IBM SPSS Statistics version 24. The analysis investigated correlations between the instructors' current position (question 3) with the instructors' desire to learn more about teaching and

TABLE 2: Examples of coding and condensation, question 26.

Examples of full quotations	Examples of condensation	Examples of coding
As above....faculty members when I was a student.	Faculty members when a student	Role models
I cannot say a single person but my style is more of an amalgamation of six to eight people whom I feel are excellent in the classroom.	Multiple, excellent classroom teachers	Role models
The desire to help our students succeed as veterinarians in whatever career route they chose, to impact them in such a way as to influence their lives in a positive way.	Desire to help students succeed	Students
My residency mentor.	Mentor	Role model
No one person has been most influential – really numerous mentors, each with various strengths.	Numerous mentors	Role models
A crusty old ruminant physiology professor named A.D. A.D. taught acid-base physiology, as well as general physiology. His Socratic style of teaching through questioning was a huge influence on me. He did not just give you the answer – you had to work for it.	Physiology professor and previous teacher	Role model
A biology teacher in high school.	Previous high school teacher	Role model
My father (a high school biology teacher), a high school math teacher who helped conquer my fear of that subject and a college professor who got me interested in my research field.	High school teacher/father	Role model
My mom. She was an elementary teacher while I was growing up. She went above and beyond to inspire and educate her students. Seeing the difference she made in 1000s of kids helped push to be an educator.	Elementary teacher who inspired and educated students	Role model
My first boss in general practice.	Veterinarian, boss in private practice	Role model
Numerous previous instructors.	Previous instructors	Role model

instructional strategies (question 7). The latter question used a Likert scale with six responses from 1 (not at all) to 6 (most definitely). In G*Power Version 3.1.9.2, the statistical test was defined as Correlation: Point Biserial model, and the type of power analysis was defined as post hoc: Compute power – given alpha, sample size and effect size.

Ethical considerations

This project received Institutional Review Board approval with protocol ID: IRB-17-416 from the Mississippi State University.

Results

The results of this study supported the assumption that many instructors at a single institution arrived at their position from varied backgrounds (Table 3). In fact, 30 different institutions or colleges were represented when looking at the educational backgrounds of the participants. These varied backgrounds increased the quality of data received, allowing a view through the lenses of these educators to obtain insightful and meaningful responses (Rubin & Rubin 2012).

TABLE 3: Reported instructor educational backgrounds.

Participant	Educational background
1	Mississippi State University
2	University of Georgia, DVM Mississippi State University, MS
3	Cook College, Rutgers University, BS (Animal Sciences) Tufts University (Cummings) School of Veterinary Medicine, DVM University of Georgia, PhD (Infectious Diseases)
4	Dalhousie University, BS Ontario Veterinary College, DVM
5	Mississippi State University, BS, DVM, DABVP
6	The State University of New York at Buffalo, BA Cornell University, DVM, DACVA
7	University of Dublin-Trinity College University of Guelph Rutgers University Princeton University
8	Washington State University, DVM Carolina Veterinary Specialists, Rotating Internship Mississippi State University, Specialty Internship Auburn University, Residency
9	Virginia-Maryland Regional College of Veterinary Medicine, DVM Mississippi State University, MS, Internship, Residency
10	Louisiana Tech, BS Louisiana State University, DVM University of Minnesota, MS, Internship, Residency, DACVIM
11	National University of Mexico, DVM, MS The University of Georgia, PhD
12	Shanxi Agricultural University, BS China Agricultural University, MS Mississippi State University, PhD, Post-doc
13	Washington State University, DVM and Internship Mississippi State University, Residency
14	University of Virginia, Master of Arts in English Language and Literature Mary Baldwin College, Post-Graduate Teaching Certification Virginia-Maryland Regional College of Vet Med, DVM Louisiana State University, Rotating Equine Internship University of California/Davis, Equine Surgery Residency
15	Louisiana State University Medical School in Shreveport, PhD University of Alabama at Birmingham Medical School, Post-doc Medical College of Virginia, Richmond, Sabbatical
16	Auburn University, BS, MS College of Veterinary Medicine, Mississippi State University, PhD
17	Ontario Veterinary College, DVM, Internship, and Residency University of Missouri – Columbia, DABVP, DACVIM
18	Mississippi State University, BS, DVM, MS, ACVPM (Diplomate) University of Florida, Graduate Certificate
19	The Ohio State University
20	Mississippi State University, BS, MS, DVM Auburn University, Small Animal Rotating Internship
21	Mississippi State University, DVM University of Southern Mississippi, MPH

DVM, Doctor of Veterinary Medicine; MS, Master of Science; BS, Bachelor of Science; PhD, Doctor of Philosophy; DABVP, Diplomate of the American Board of Veterinary Practitioners; BA, Bachelor of Arts; DACVA, Diplomate of the American College of Veterinary Anesthesiologists; DACVIM, Diplomate of the American College of Veterinary Internal Medicine; ACVPM, American College of Veterinary Preventive Medicine; MPH, Masters of Public Health.

How do veterinary faculty obtain pedagogical knowledge?

Based on the survey results, it was found that most instructors ($n = 27$; 93%) did not receive formal teacher training, which supported the initial proposition. Only two participants had received prior formal education training: one had a BS in Education and the other had taken two education curriculum graduate-level courses. Much of the faculty who responded to question 10 ($n = 20$) reported attendance to university-sponsored workshops or seminars ($n = 14$; 70%) held by the Center for Teaching and Learning once already in their faculty appointments. For instance, Dr Y stated, 'I have attended seminars at a number of different institutions that I have worked at covering a variety of topics ... PowerPoints, organisation, use of clickers, etc.' (Associate Professor, Southeastern United States). Faculty

who attended conferences related to teaching and instruction ($n = 3$; 15%) described learning about problem-based learning, test writing and clinical instruction. Independent study and self-directed learning was used by a few faculty members ($n = 2$; 10%), as demonstrated by Dr A's willingness to personally read books on the subject: 'In my reading, I noticed several references indicating that enthusiasm is a more powerful explanatory variable than most others in relating to student success' (Professor, Southeastern United States). One faculty member had taken two graduate courses since entering the faculty appointment and noted,

'The Assessment and Evaluation course was my favorite. I was made more aware of how to present essential material to the students in a clear and direct way, and how to compose a test that determines the effectiveness of instruction.' (Participant M, Associate Professor, Southeastern United States).

In an interesting contrast, 21 faculty members reported learning about teaching prior to their faculty appointments by emulating a past teacher they admired as students.

Who do veterinary faculty source their knowledge from?

The majority of faculty who responded to question 26 ($n = 24$) reported obtaining their knowledge from a role model of some sort ($n = 21$; 88%). Of those responding that role models were a significant source of pedagogical knowledge, four stated that their parents were teachers and served as a significant influence in becoming an educator themselves. When responding to question 27, many participants ($n = 20$; 69%) indicated that they emulate past or present teachers and most of those ($n = 15$; 75%) modelled teachers or professors they had when they themselves were students.

Dr C illustrated,

'Several were role models for enthusiasm. ...While I am not sure I remembered more of what they taught, they modeled passion for learning, for teaching, and for the profession. Several were role models for clarity, brevity and organization ... even though they provided less "content", what they taught me was remembered ("less is more").' (Professor, Southeastern United States)

Dr U explained,

'That is how I have developed my teaching styles. I looked at my professors during veterinary school, and the faculty members, and tried to use techniques that were effective in my teaching style.' (Assistant Professor, Southeastern United States)

What types of instructional strategies do veterinary instructors obtain or use?

Responses to questions 11, 12 and 25 were best summarised and conceptually coded across all participants ($n = 29$) to provide the most meaningful description of the data. This process was performed similarly to the descriptions in Table 2. The resulting themes were ranked in order according to the frequency of response category and quotes from open-ended questions were used to provide rich descriptions.

Utilise student feedback

Survey participants considered utilising student feedback as a way to gauge the effectiveness of their instructional strategies and if they should make changes to the types of strategies currently in use. Furthermore, they use student feedback as a way to increase teacher enthusiasm.

'Student feedback. I consistently alter clinical teaching based on student feedback. Students tell you (in one way or another) how they learn best and where the gaps are in their education. I try to alter my delivery and fill these gaps – especially with 3rd and 4th year students.' (Participant R, Professor, Southeastern United States)

'Teaching style has been an evolution based on student performance and feedback.' (Participant Q, Professor, Southeastern United States)

Develop rapport and show interest in students

Survey participants saw the need to connect with students on a personal level and make sure that the students feel supported and cared for.

'Connecting with the students and seeing them enthusiastic, appreciative, and understand the material (without focusing only on the test).' (Participant B, Associate Professor, Southeastern United States)

'1. Make learning fun (use of anecdotes from previous life experiences to 'make a point'). 2. Give students a role in their education (ask for feedback or questions before, during and after class). Make certain that they're 'getting it' (assume nothing). Find out where they are beginning before moving on.' (Participant D, Professor, Southeastern United States)

Emphasise the practical relevance of content

Survey participants saw the need to lead students on a journey of synthesising memorised material, facts and lectures into the greater clinical picture of caring for patients, performing surgery and communicating to other professionals.

'As a student, I sat through years of lectures wondering about the subject relevance to vet practice. But when I started clinical rotations, I began to see the relevance of that didactic material, which lead to asking more why questions. "Why" questions lead to "how" (Why do we do that? How does that work?). I have always asked students to explain why they wish to do specific things on rotation and have tried to incorporate clinical examples in the didactic courses to provide a frame of reference. I also try to use underlying principles to support how and why we do things the way we do.' (Participant L, Professor, Southeastern United States)

'1. I have tried to incorporate clinical scenarios in lectures and rounds, as well as give examples from cases when discussing things one on one.' (Participant U, Assistant Professor, Southeastern United States)

Learn different teaching and assessment techniques

Survey participants understood that they did not enter their faculty appointment with all the pedagogical knowledge needed to effectively teach. They must therefore learn new concepts.

'understanding by design, writing clear, understandable instructional objectives and assessment accommodations for

student diversity.' (Participant M, Associate Professor, Southeastern United States)

'It uncovered the science behind teaching and educational psychology for which I was previously ignorant. It's nice to learn evidence-based practices for teaching similar to what we learn for veterinary medicine.' (Participant X, Assistant Professor, Southeastern United States)

'Use of failure when taking pedagogical risks – try things even if they don't work; pre-post concept testing; that students perceive themselves as victims of their monster mentors – attempting to show a human side in daily actions may reduce that dynamic.' (Participant L, Professor, Southeastern United States)

Emphasise passion or enthusiasm for content

Survey participants conveyed that not only should veterinary educators be passionate about animals, displaying passion and enthusiasm for veterinary medicine as a discipline, but also the content being taught is important for student learning.

'1. Vital for teacher to demonstrate enthusiasm/passion for discipline; 2. Basic principles are important, but teacher must stress clinical relevance early and often; 3. Students are more willing to learn from a teacher they like or respect than from one they don't. ...While I am not sure I remembered more of what they taught, they modeled passion for learning, for teaching, and for the profession.' (Participant C, Professor, Southeastern United States)

'I learned a lot about teaching from my mentors. However, I think enthusiasm for teaching comes from within. This enthusiasm, or lack thereof, is absolutely noticed by the students.' (Participant T, Associate Professor, Southeastern United States)

Maintain reasonable grading expectations

Survey participants realised that this includes learning how to write well-crafted exam questions that test synthesised knowledge and not just memorisation of facts. This also involves being consistent from student to student when subjective grading is involved.

'I recognized mistakes I was making with writing test questions. I am more familiar with concepts and strategies that allow test questions to more accurately assess an examinee's knowledge and understanding. Test questions that require conceptual understanding rather than just memorization, fair test questions with only one correct answer, fair questions without misleading distractors.' (Participant K, Clinical Instructor, Southeastern United States)

'Listen to student concerns, respond in a timely manner, be consistent with grading.' (Participant G, Professor, Southeastern United States)

Use multiple teaching strategies or be flexible

Survey participants stated that they must be lifelong learners and learn new, innovative ways to educate veterinary students, even if that means trying new techniques and failing. The participants also suggested that different strategies may be more effective for one learner versus another.

'Use of failure when taking pedagogical risks - try things even if they don't work; pre-post concept testing.' (Participant L, Professor, Southeastern United States)

'Strategy – in clinical teaching, its all about being flexible. One strategy may not work for all. AND we have to make the learning environment comfortable by keeping the student relaxed. I try to ascertain if an individual is "getting it" – if not, I try another way to explain (visuals, models, etc.).' (Participant R, Professor, Southeastern United States)

Use current and interesting examples or use current literature

Survey participants conveyed that research and current literature can inform and enhance the learning environment. Therefore, veterinary educators should see the need to read up on the current literature in clinical veterinary medicine and apply this to their instructional strategies.

'Given a limited amount of preparation time I spend more of it trying to find interesting and exciting examples that illustrate the potential clinical importance of the concept or illustrating new therapies that are just coming to human medicine and will likely make their way to veterinary medicine soon.' (Participant A, Professor, Southeastern United States)

'I try to incorporate stories (e.g. cases or something I've read in a research article) that are both interesting, sometimes bizarre, or just fun so they can remember an association; I try to invest in the class hoping they invest in it too.' (Participant B, Associate Professor, Southeastern United States)

Additional findings of interest

Results from a post hoc quantitative analysis of veterinary educators ($n = 29$) yielded one significant Pearson correlation with a medium effect size, a power of 0.65 and $\alpha = 0.05$. A significant correlation ($r = -0.41$; $p < 0.05$) demonstrated a moderate negative relationship between current job title or position and the level of desire to learn more about effective teaching methods. To elaborate, the relationship indicated decreases in the level of desire to learn more about teaching as job title or position increased among veterinary faculty. In an interesting contrast, most participants who responded to question 32 ($n = 27$) stated that teaching in veterinary medicine was both an innate and learned ability ($n = 24$; 89%), indicating that many veterinary faculty understand that it is possible to improve instructional strategies and further develop pedagogical knowledge.

Dr S stated:

'I think the most successful teachers have a passion for teaching that really cannot be taught. Teaching can certainly be enhanced through instruction and when these two are merged a very proficient instructor develops.' (Associate Professor, Southeastern United States)

Dr A clarified:

'We have a faculty member in my department who does careful self-evaluations each year of his teaching and uses them to improve. His evaluation scores from students have consistently improved over time. However, the teachers who are typically rated as the very best (the ones who win awards, etc.) are often gifted in ways or have a personality that would be difficult for someone without those gifts or personality to emulate.' (Professor, Southeastern United States)

Discussion

The results of this study support the proposition that most veterinary instructors do not receive formal teacher education prior to their teaching appointments. Three overarching themes emerged from the analysis across all survey item responses and sample strata. The first two represent the emotional and personal component of educators.

- Rapport, respect, caring for, or understanding students.
- Passion or enthusiasm for subject.

When listing how a role model influenced his teaching strategies, one participant noted:

'1. Vital for teacher to demonstrate enthusiasm/passion for discipline; 2. Basic principles are important, but teacher must stress clinical relevance early and often; 3. Students are more willing to learn from a teacher they like or respect than from one they don't.' (Participant C, Professor, Southeastern United States)

These non-cognitive characteristics arose repeatedly in response to open-ended questions and described the need for veterinary educators to ensure that their students feel cared for and respected. The characteristics also described the perceived need to display some sort of positive emotional connection that educators have with the material they are teaching. These two overarching themes validate previous research findings regarding the importance of interpersonal skills for effective teaching (Bing-You et al. 2017; Buskist et al. 2002; Irby 2014; Keeley, Ismail & Buskist 2016; Keeley, Smith & Buskist 2006). When considering non-cognitive characteristics of teachers, these may be defined as problem-solving skills, emotional health, social skills, work ethic, community responsibility, affection, open communication, rapport, enthusiasm and creativity (Borghans, Meijers & Ter Weel 2008; Keeley et al. 2016). Faculty members already have a good command of content knowledge and appear to be in higher level positions where a more holistic view of teaching and content knowledge is required; therefore, they may be looking for specific ways to enhance these non-cognitive teacher traits. Also, faculty may have more time to reflect about the development of non-cognitive skills, therefore enhancing non-cognitive traits and allowing them to become more effective teachers. Based on the points mentioned above, non-cognitive skills matter and should become more prominent in teacher development programmes and educational policy (Garcia 2014). Following these first two themes, the third overarching theme shifts to the emphasis of pedagogical acquisition.

- Observation of models plays an important role in teacher development.

One participant detailed this well:

'I try to emulate parts of the teaching style from many of my professors. I remember what inspired me to succeed while in vet school and try to emulate those teaching strategies.' (Participant K, Clinical Instructor, Southeastern United States)

This theme was clearly articulated by a majority of participants and emphasises how veterinary faculty utilise

observational learning within social cognitive theory (Bandura 1986). Situated cognition and cognitive apprenticeship theories appear to play an important role in veterinary instructor development and should be considered when building teaching development programmes. Korthagen (2004) made a strong argument for focused core reflection being essential in improving the educator, and this interview process could pilot what this reflection process may look like for veterinary educators. This exercise takes the teachers on a journey to discovering their professional identity and knowledge acquisition. It includes reflecting on role models, events, communities and social constructs that have positively or negatively shaped one's professional identity. When teachers become more self-aware, they can make choices that positively impact their professional development and their teaching practices. As clinical educators source their pedagogical knowledge from observation of role models, using a similar strategy in teacher development programmes would be a natural model to effect change.

The findings of this study prompt more questions. Limitations of this survey included a lack of examination of the quality of instructor knowledge. An assessment measuring gaps in instructors' pedagogical knowledge and whether veterinary educators feel fully equipped to teach would provide valuable information. Important parameters of effective teaching, the engagement in the scholarship of teaching and learning and other scholarly contributions were not surveyed, which could have added further depth to a study of this nature. A more detailed survey and analysis of common themes among veterinary educators on what instructional strategies are currently used and the effectiveness of these strategies could highlight deficits in pedagogical knowledge and inform needed innovations in veterinary medical education. When this is known, teacher development programmes could be tailored to meet these pedagogical gaps.

Conclusion

Most veterinary educators in this study did not receive formal teacher training, and instead derived their pedagogical knowledge from role models and past teachers prior to their faculty appointment. Situated cognition and cognitive apprenticeship theories appear to play an important role in veterinary instructor development. Overarching themes reflected observational learning while in the natural educational environment when faculty were themselves students. A general emphasis on non-cognitive skills development, particularly regarding interpersonal skills, emerged as an important proficiency among veterinary educators.

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Competing interests

The author declares that he has no financial or personal relationships that may have inappropriately influenced him in writing this article.

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