ORIGINAL RESEARCH

Clinical supervisors' and students' perspectives on preparedness for veterinary workplace clinical training: An international study

Jennifer Routh[1] | Sharmini Julita Paramasivam[1] | Peter Cockcroft[1] |
Sarah Wood[2] | John Remnant[3] | Cornélie Westermann[4] | Alison Reid[5] |
Patricia Pawson[6] | Sheena Warman[2] | Vishna Devi Nadarajah[7] |
Kamalan Jeevaratnam[1]

[1]School of Veterinary Medicine, University of Surrey, Guildford, UK

[2]Bristol Veterinary School, University of Bristol, Bristol, UK

[3]School of Veterinary Medicine and Science, University of Nottingham, Sutton Bonington, UK

[4]Faculty of Veterinary Medicine, Utrecht University, Utrecht, The Netherlands

[5]School of Veterinary Science, University of Liverpool, Liverpool, UK

[6]School of Biodiversity, One Health and Veterinary Medicine, College of Medical, Veterinary and Life Sciences, University of Glasgow, Glasgow, UK

[7]Division of Human Biology, School of Medicine and IMU Centre for Education, International Medical University, Kuala Lumpur, Malaysia

Correspondence
Kamalan Jeevaratnam, School of Veterinary Medicine, University of Surrey, Guildford, Surrey, UK.
Email: drkamalanjeeva@gmail.com

Abstract

Background: The alignment of student and workplace supervisors' perspectives on student preparedness for veterinary workplace clinical training (WCT) is unknown, yet misalignment could negatively impact workplace learning. The aim of this study was to quantify the relative importance of WCT preparedness characteristics according to students and supervisors and to identify differences.

Methods: A survey was completed by 657 veterinary students and 244 clinical supervisors from 25 veterinary schools, from which rankings of the preparedness characteristics were derived. Significant rank differences were assessed using confidence intervals and permutation tests.

Results: 'Honesty, integrity and dependability' was the most important characteristic according to both groups. The three characteristics with the largest rank differences were: students' awareness of their own and others' mental wellbeing and the importance of self-care; being willing to try new practical skills with support (students ranked both of these higher); and having a clinical reasoning framework for common problems (supervisors ranked higher).

Limitations: Using pooled data from many schools means that the results are not necessarily representative of the perspectives at any one institution.

Conclusion: There are both similarities and differences in the perspectives of students and supervisors regarding which characteristics are more important for WCT. This provides insights that can be used by educators, curriculum developers and admissions tutors to improve student preparedness for workplace learning.

KEYWORDS
clinical supervisors, preparedness, readiness, survey, veterinary students, workplace learning

INTRODUCTION

Veterinary workplace clinical training (WCT) is an essential component of veterinary school curricula and usually occurs within the final 12–18 months of the programme. Factors that constitute students' preparedness for this phase have been characterised qualitatively,[1] and students' perspectives at a single institution have been quantified.[2] However, it is likely that supervisors' perspectives are less naïve than students' as they view preparedness for WCT with preceding practical knowledge. Determining differences in students' and supervisors' perspectives and communicating these differences to stakeholders could

represent the first steps in establishing congruent expectations of students. Interventions based on these different perspectives could lead to improved supervisor satisfaction and reduced student stress associated with the transition, possibly resulting in more optimal learning during WCT.

WCT involves veterinary students' authentic participation in a spectrum of clinical activities under supervision. As with extramural studies in the UK, WCT students become active agents in their own learning,[3] although WCT tends to be more structured and formalised.[4] There are multiple theoretical perspectives from which to view learning during WCT.[5] From a cognitive perspective, students 'transform' theoretical knowledge they have learned in the preceding years into practice in a realistic setting.[6] When viewed socioculturally, WCT enables students to learn how to perform, think and interact in ways that work for the specific context,[7] establishing students' affective and social foundations for working life.[8] Learning during WCT is heavily influenced by the hidden curriculum,[9] and the workplace provides a developmental space for students to develop their professional identity.[10]

There are also several ways in which to view the transition to WCT: as either a threat to learning or an opportunity for accelerated growth.[11] Veterinary students can feel anxious about the transition to WCT,[4] and they report that adapting to learning in the veterinary workplace is challenging.[12] In the wider health profession education (HPE) literature, students' transition to workplace learning has been described as a step change,[13] abrupt,[13,14] effortful,[15] and in some cases, it can be a 'crisis'[15] moment. Although a small amount of transitional stress can be a powerful motivator to change or develop, too much can inhibit learning.[16-18] As such, transitions are often considered as a potential threat to students[11] and something that should be 'smoothed'. Furthermore, problems with transitions are mainly viewed as a deficiency in the transitioning individuals themselves, and it is frequently suggested that the remedy lies in curriculum changes to 'better prepare' students,[19] for example, using specific preparation courses.[20]

Rather than a threat, an alternate view on the transition to WCT is that it is an opportunity for transformative learning,[11] called a 'critically intensive learning period'.[21] This view acknowledges that there will always be contextual and structural aspects of each workplace that are different,[22,23] so the 'step up' to WCT can never be smoothed[19] and it is not possible to be fully prepared for every eventuality.[13,21] This means that while students' knowledge is likely to be important for their new role after a transition, it is not the be-all and end-all in terms of preparedness.[24] Instead, support can be provided by helping students prepare the awareness, skills and attributes (i.e., the 'survival skills'[25]) they need to effectively cope with challenges. In light of this perspective, the 'preparedness toolkit' is a conceptual framework that has been developed as a useful way to consider preparedness for veterinary WCT.[5] The 'preparedness toolkit' content is derived from learning theory and includes tools that, if possessed by the veterinary student, will support them in learning and working during WCT while negotiating the challenge of the critically intensive learning period.

Students' preparedness for WCT is important for both the students themselves and the clinical supervisors who oversee their working/learning. For students, their preparedness impacts their ability to engage in WCT. If students are not adequately prepared, then they will not be able to identify and harness opportunities to learn in the workplace,[26] and they will not gain the competences required before graduation.[27,28] In short, preparedness impacts students' performance.[29,30] Additionally, students who are unprepared for the transition to workplace learning feel stressed,[31] and stress associated with education transitions increases veterinary student anxiety and symptoms of depression and decreases life satisfaction and general health.[32] Furthermore, a lack of explicit expectations for WCT could negatively impact students' perception of their own preparedness because they feel unable to prepare for the unknown.[33]

From the clinical supervisors' perspective, shortcomings in students' preparedness can be frustrating[34] and can impact their job satisfaction.[35] Furthermore, unprepared students will add to the demanding nature of the student/supervisor relationship,[28] and the quality of this relationship is likely to be the single most important factor for effective workplace supervision.[36]

The supervisory relationship could also be jeopardised if expectations are mismatched, and subsequently, learning opportunities might be missed by students.[37] In effect, clinical supervisors can be considered 'gatekeepers'[38] with the power to open doors to learning opportunities for students in the workplace. If the students are not prepared with the right 'keys' to open those doors, if they do not meet supervisor expectations, then they will not be able to learn. Therefore, no participant, supervisor or student, no matter how good, can create an environment in which learning occurs without a complementary approach from the other party. As such, it is potentially problematic that in other HPE fields, staff and students have different perspectives on how to be prepared for workplace learning,[33,39-41] and there is tentative evidence suggesting similar results in veterinary education.[42,43] The first step in addressing this problem is to determine where differences in expectations exist.[44]

There is extensive literature published regarding preparedness for graduate veterinary practice,[45-51] but this study specifically explores preparedness for the preceding phase: pre-qualification workplace-based learning. Therefore, this study aimed to examine the similarities and differences in the perspectives of workplace clinical supervisors and pre-WCT veterinary students regarding preparedness for veterinary WCT. To achieve this aim, we sought to rate and rank the relative importance of a prescribed range of WCT preparedness characteristics and themes from the perspectives of these two groups.
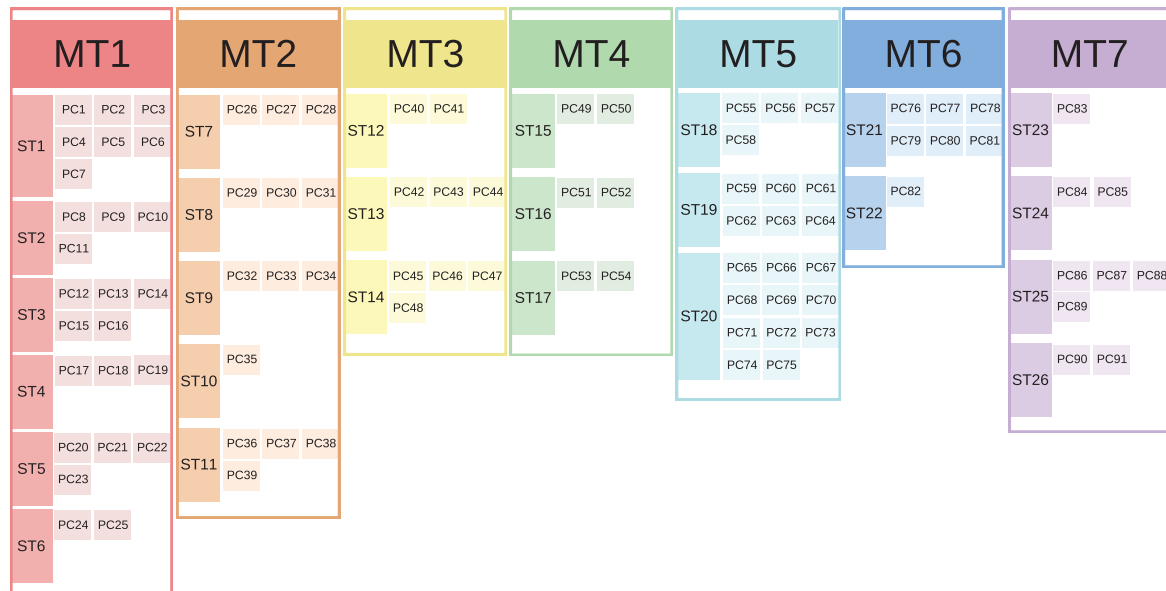
FIGURE 1 The three-tier taxonomy of preparedness characteristics (PC), subthemes (ST) and main themes (MT) derived from qualitative analysis of group interviews with key stakeholders discussing veterinary student preparedness for workplace clinical training

MATERIALS AND METHODS

Survey design

Between August 2021 and July 2022, a survey was conducted to measure students' and clinical supervisors' perspectives on student preparedness for WCT. This survey was hosted on the Qualtrics online platform (Qualtrics XM; www.qualtrics.com/). Previous work detailing the survey design, piloting, validity and reliability have been published by the authors separately.[52]

The survey comprised three sections. First, demographic information was collected. Second, each participant completed pairwise comparison questions. These involved comparing two preparedness characteristics at a time with the respondents selecting the characteristic they thought was the more important for WCT. The characteristics used in the survey were derived from the qualitative analysis of group interviews discussing WCT preparedness.[1] This study generated 91 preparedness characteristics, organised into 26 subthemes and seven main themes (Figure 1). Each participant was randomly assigned 50 pairwise comparisons to perform from a bank of 4095 (representing all possible pairwise combinations). Finally, respondents were asked to directly rank the seven main preparedness themes in order of importance. Participants were provided with expanded definitions of the themes (Supporting Information S1).

Sampling

Sixty-five veterinary schools were approached to take part in the study via email or virtual meetings. Inclusion criteria are provided in Supporting Information S2. Twenty-five schools participated, and local champions (senior faculty with responsibilities for research, clinical teaching and/or workplace learning) were identified in each. Local champions were sent the participant inclusion criteria (Supporting Information S2) and recruitment material to forward to the required participants: pre-WCT veterinary students and workplace clinical supervisors. Previous work identified that a minimum of 40 participants per group should be the target number to generate stable ranks of the preparedness characteristics.[52] Participants were offered the opportunity to take part in a prize draw to win e-vouchers upon completion.

Data processing: generating preparedness characteristics' importance ratings and ranks

All data processing and analyses were performed in R Studio (RStudio) using the first author's published n.mEloRatings package (https://github.com/jennyrouth/n.mEloRatings). The pairwise comparison data were pooled by participant group (students or supervisors). Each pooled dataset was processed separately using the Elo algorithm to generate min–max normalised[53] importance ratings of the preparedness characteristics (n.mElo ratings) per group. The preparedness characteristic with an importance rating of one represents the most important according to the participant group, while the characteristic with an importance rating of zero represents the least important. Mathematical details are provided elsewhere.[52] When ordered numerically, the ratings were transformed to ranks.

Data analysis

Data analysis compared the preparedness characteristic and theme ratings and ranks between clinical supervisors and students.

TABLE 1 Survey respondent numbers by continent

Continent	Number of veterinary schools	Number of veterinary student respondents	Number of clinical supervisor respondents
Europe	8	477	172
North America	14	152	63
Australia	3	28	9
Total	25	657	244

Correlation analysis of preparedness characteristics' importance ratings and ranks

Shapiro–Wilk tests determined the normality of importance ratings for each group. At the 0.05 significance level, students' importance ratings were normally distributed, while supervisors' ratings were not ($p = 0.15$ and 0.03, respectively). Subsequently, Spearman's rank correlation coefficient was calculated for the two groups' preparedness characteristics importance ratings. Kendall's Tau-b correlation coefficient was calculated for the preparedness characteristics ranks of the two groups, both as an entire set and when grouped according to the characteristics' overarching main theme.

Identifying preparedness characteristics with significantly different ranks between groups

Permutation tests and bootstrapped confidence intervals were used to determine the preparedness characteristics for which the importance ranks assigned by students and supervisors were significantly different. These methods are complementary[54] but differ in the mechanism by which they assess the groups' rank difference for preparedness characteristics (see Supporting Information S3). The bootstrap provides an estimate of precision for the observed value (between-group rank difference). It permits the assessment of confidence that the difference in ranks for a given characteristic is not zero. If the 95% confidence interval for the between-group rank difference did not include zero, the probability of the true difference in rank of the characteristic being zero was less than 0.05.

Permuting generates datasets under the null hypothesis, that is, there is no difference in the rank of a preparedness characteristic between groups. The permutation tests provide an p-value for every preparedness characteristic, indicating whether the groups' ranks were significantly different or not. For each preparedness characteristic, a one-sided test was performed, and the direction was determined by considering the observed rank difference (the test statistic). If the observed rank difference was zero, a two-sided test was performed.

Preparedness subtheme ranking comparison

The 91 preparedness characteristics are organised into 26 subthemes.[1] The median rank of the prepared-

TABLE 2 Clinical supervisor survey respondents by primary area of clinical practice

Area of clinical practice	Number of clinical supervisor respondents	Percentage of clinical supervisor respondents (%)
Small animal general practice or primary care	46	18.9
Small animal specialty practice	90	36.9
Equine general practice or primary care	11	4.5
Equine specialty practice	39	16.0
Farm animal/production general practice or primary care	26	10.7
Farm animal/production specialty practice	16	6.6
Zoo/wildlife/exotics practice	5	2.0
Pathology	4	1.6
Veterinary public health	2	0.8
Other (charity/shelter medicine [$n = 2$], anaesthesia [$n = 1$], camelid [$n = 1$], all of the above [$n = 1$])	5	2.0
Total	244	100

ness characteristics incorporated by each subtheme, for each group, was calculated. When ordered numerically, the median ranks were transformed to overall importance ranks for the subthemes.

Preparedness main theme ranking comparison

Using data from the third section of the survey, to determine if the students' and supervisors' ranks for the main themes were different, a two-sided Mann–Whitney U-test was performed for each theme. Post hoc one-sided tests were performed for any significant results.

RESULTS

Survey metadata

The survey was completed by 657 veterinary students and 244 clinical supervisors, collectively performing 32,850 and 12,200 pairwise comparisons, respectively. The respondents were from 25 veterinary schools (Table 1). Clinical supervisor respondents were working in a number of clinical areas (Table 2), but there was a notably large proportion working in specialty practice (59.6%). There was also a large proportion in small animal practice (55.8%), which is representative of the broader profession, at least in the UK (52.6% in 2019[55]). The majority of clinical supervisor respondents had 10 or more years of clinical experience (61.9%, Table 3).
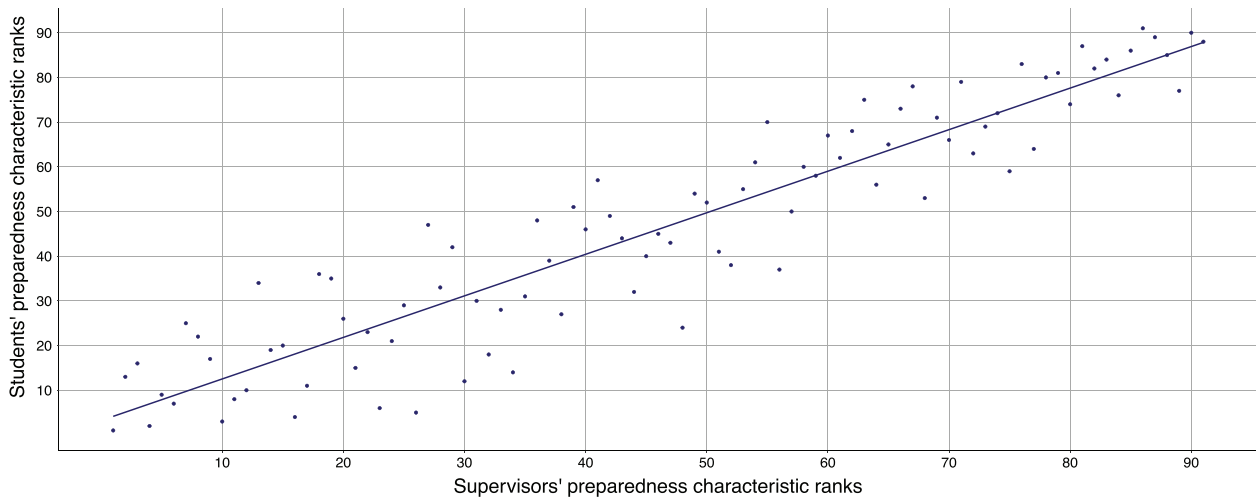
FIGURE 2 A scatter plot and linear regression line demonstrating the relationship between veterinary students' and clinical supervisors' importance ranks for preparedness characteristics

TABLE 3 Clinical supervisor survey respondents by years of clinical experience

Years of clinical experience	Number of clinical supervisor respondents	Percentage of clinical supervisor respondents (%)
0–4	31	12.7
5–9	62	25.4
10+	151	61.9
Total	244	100

Data analysis

Correlation analysis of preparedness characteristics' importance ratings and ranks

Preparedness characteristics with low importance ratings according to veterinary students were highly likely to also have low importance ratings according to clinical supervisors and vice versa (r(89) = 0.93, $p <$ 2.2e-16). Similarly, preparedness characteristics with low *ranks* according to students were likely to also have low ranks according to clinical supervisors and vice versa ($r_\tau = 0.77$, $p < 2.2$e-16) (Figure 2). Therefore, the correlation between the two groups' preparedness characteristic ratings and ranks was very strong and strong, respectively.[56,57]

Identifying preparedness characteristics with significantly different ranks between groups

The ratings and ranks of the 91 preparedness characteristics according to student and clinical supervisor respondents are presented in Table 4.

The preparedness characteristics ranked as most important for each group are presented in Figure 3. The highest ranked characteristics for students were (1) honesty, integrity and dependability (PC13), (2) students' awareness that perfection is not expected, failure or mistakes are likely and they are part of the learning process (PC40), (3) resilience in the face of failure, low-level stress and the pressure of the work-

place (PC41), (4) client communication skills—able to deliver and discuss information (PC59), and (5) willingness to try new practical skills with appropriate support (PC52). Resilience and expecting to fail were also ranked highly by the supervisors (10th and fourth, respectively), but being willing to try new practical skills was ranked 21 places lower by the supervisors.

The top-ranked characteristics for supervisors were (1) honesty, integrity and dependability (PC13), (2) logical independent thought processes and making sensible attempts to reason (PC67), (3) students' awareness that being proactive, enthusiastic, demonstrating competence and being confident can bring them opportunities in the workplace (PC32), (4) students' awareness that perfection is not expected, failure or mistakes are likely and they are part of the process (PC40), and (5) receptivity to feedback, including critical or constructive feedback (PC43). An understanding of how to gain opportunities to learn in the workplace was ranked 13 places lower by the students.

The five preparedness characteristics ranked least important for each group are presented in Figure 4.

The preparedness characteristics with the largest differences in rank were: students' awareness of their own and others' mental wellbeing and the importance of self-care (PC48, ranked 24 places higher by students); being willing to try new practical skills with support (PC52, ranked 21 places higher by students); having a clinical reasoning framework for common problems (PC65, ranked 21 places higher by supervisors); students' awareness of uncertainty and risk in clinical decision making (PC74, ranked 20 places higher by supervisors); and empathy, compassion and kindness (PC61, ranked 20 places higher by students).

Preparedness subtheme ranking comparison

'Learning to fail and failing in order to learn' (ST12) was the most important preparedness subtheme according to both groups. There was a difference of five ranks for the subtheme 'competence and confidence handling animals' (ST24), which was ranked

TABLE 4 Importance ratings and ranks of 91 preparedness characteristics for veterinary workplace clinical training according to the perspectives of students and clinical supervisors, ordered by clinical supervisor rank. The rank difference, its 95% confidence interval (CI) and significant outcomes of the permutation test are presented

Preparedness characteristic		Clinical supervisors		Veterinary students		
Code	Name	Importance ranking	Importance rating	Importance ranking	Importance rating	Difference in ranking [95% CI]
PC13	Honesty, integrity, dependability	1	1.000	1	1.000	0 [0.0,2.0]
PC67	Logical, independent thought processes and making sensible attempts to reason	2	0.869	13	0.828	11* [5.0,17.0]
PC32	Students' awareness that being proactive, enthusiastic, demonstrating competence, and confidence can bring them opportunities in the workplace	3	0.842	16	0.804	13** [1.0,17.0]
PC40	Students' awareness that perfection is not expected; failure or mistakes are likely, and they are part of the learning process	4	0.817	2	0.974	−2 [−13.0,0.0]
PC43	Receptivity to feedback, including critical or constructive feedback	5	0.812	9	0.881	4 [−8.0,8.0]
PC09	Teamwork, students putting themselves forward or offering to help	6	0.812	7	0.888	1 [−9.0,7.0]
PC66	Able to assimilate and understand the importance of clinical information in the case	7	0.807	25	0.737	18** [8.0,25.0]
PC71	Problem solving and forming problem and/or differential diagnoses lists	8	0.783	22	0.751	14** [4.0,23.0]
PC82	Integrating and applying knowledge to cases	9	0.782	17	0.800	8 [−5.0,14.0]
PC41	Resilience in the face of failure, low-level stress and the pressure of the workplace	10	0.770	3	0.951	−7* [−17.0,1.0]
PC28	Students' awareness of the value of the entire veterinary team and how students can learn from all of them	11	0.764	8	0.881	−3 [−16.0,7.0]
PC55	Team communication skills	12	0.760	10	0.858	−2 [−14.0,7.0]
PC65	Having a clinical reasoning framework for common problems	13	0.757	34	0.668	21** [9.5,32.0]
PC69	Clinical reasoning skills when faced with multiple clinical problems	14	0.746	19	0.774	5 [−8.0,15.0]
PC29	Identifying knowledge gaps and saying 'I don't know that'	15	0.735	20	0.765	5 [−12.5,14.0]
PC59	Client communication skills—able to deliver and discuss information	16	0.734	4	0.921	−12* [−23.5, −1.0]
PC49	Motivated to learn for a career in veterinary medicine, not for a grade or as a tick box exercise	17	0.725	11	0.850	−6 [−16.0,5.0]
PC33	Proactive in seeking personal learning opportunities	18	0.714	36	0.641	18** [0.0,25.5]
PC30	Filling knowledge gaps, self-directed learning	19	0.708	35	0.661	16** [2.0,26.0]
PC91	Appropriate knowledge of what's normal on a clinical examination, for example, temperature, pulse and respiration rates	20	0.702	26	0.715	6 [−6.0,19.0]

(Continues)

TABLE 4 (Continued)

Preparedness characteristic		Clinical supervisors		Veterinary students		Difference in ranking [95% CI]
Code	Name	Importance ranking	Importance rating	Importance ranking	Importance rating	
PC46	Self-awareness of limitations, strengths and weaknesses	21	0.701	15	0.820	−6 [−18.5,6.0]
PC73	Capable of proposing justified and rational clinical decisions	22	0.700	23	0.747	1 [−11.0,13.0]
PC31	Asking for help	23	0.700	6	0.896	−17** [−25.0,-2.0]
PC07	Flexibility and adaptability	24	0.695	21	0.757	−3 [−13.5,12.0]
PC63	Listening and reacting with appropriate follow up questions during history taking	25	0.692	29	0.701	4 [−6.5,18.5]
PC52	Willing to try new practical skills with appropriate support	26	0.690	5	0.898	−21** [−29.0,-7.0]
PC74	Students' awareness of uncertainty and risk in clinical decision making	27	0.689	47	0.568	20** [11.5,36.0]
PC90	Clinical/physical examination skills	28	0.684	33	0.675	5 [−6.0,19.5]
PC75	Students' awareness that there's more than one way of doing something	29	0.664	42	0.595	13* [0.5,28.0]
PC85	Working safely	30	0.657	12	0.847	−18** [−29.0,-6.0]
PC68	Taking into account non-medical, owner or contextual factors during clinical decision making	31	0.630	30	0.688	−1 [−15.0,8.0]
PC84	Competence and confidence handling animals	32	0.628	18	0.782	−14** [−27.0,-4.0]
PC35	Working and learning with other students effectively	33	0.623	28	0.702	−5 [−18.0,7.5]
PC61	Empathy, compassion, kindness	34	0.615	14	0.825	−20** [−34.0,−11.0]
PC12	Students' awareness of their own roles and responsibilities	35	0.614	31	0.685	−4 [−18.0,6.0]
PC34	Asking appropriate questions	36	0.613	48	0.568	12 [−3.0,22.0]
PC01	Students' awareness of the challenges and realities of practice for veterinary practitioners	37	0.611	39	0.612	2 [−8.0,19.0]
PC16	Calmness, level-headedness	38	0.608	27	0.710	−11 [−19.0,6.0]
PC54	Students' awareness of the transferability of skills learned during workplace clinical training	39	0.606	51	0.547	12* [0.0,24.0]
PC08	Observing what's going on in the workplace; an attentiveness	40	0.605	46	0.583	6 [−7.0,19.0]
PC19	Commitment to completion of tasks	41	0.605	57	0.484	16** [9.0,30.0]
PC51	Enthusiasm	42	0.595	49	0.562	7 [−3.0,21.5]
PC37	Self-discipline and organisation	43	0.587	44	0.589	1 [−9.0,14.0]
PC26	Students' awareness of how they learn during workplace clinical training; an active experiential process	44	0.565	32	0.680	−12* [−24.0,-3.0]
PC58	Personable and friendly	45	0.556	40	0.607	-5 [-14.0,9.5]
PC70	Knowledge of common differential diagnoses	46	0.555	45	0.584	−1 [−11.0,11.5]
PC62	Able to structure and lead a consultation including history taking	47	0.553	43	0.590	−4 [−12.0,11.0]

(Continues)

TABLE 4 (Continued)

Preparedness characteristic		Clinical supervisors		Veterinary students		Difference in ranking [95% CI]
Code	Name	Importance ranking	Importance rating	Importance ranking	Importance rating	
PC48	Students' awareness of their own and others' mental wellbeing, and the importance of self-care	48	0.538	24	0.741	−24** [−33.0,−13.0]
PC45	Engaging in meaningful reflection	49	0.521	54	0.522	5 [−7.0,14.0]
PC47	Appropriate level of self-confidence	50	0.512	52	0.536	2 [−11.0,10.0]
PC10	Social awareness, socially perceptive	51	0.501	41	0.607	−10 [−20.0,2.0]
PC57	Polite, respectful	52	0.490	38	0.614	−14* [−24.5,−3.5]
PC14	Maturity	53	0.484	55	0.506	2 [−8.0,11.0]
PC83	Know how to perform practical skills (and not necessarily be able to perform them)	54	0.478	61	0.455	7* [−3.5,16.0]
PC78	Appropriate knowledge of physiology	55	0.476	70	0.378	15** [4.0,23.0]
PC56	Listening to the clinical supervisor	56	0.474	37	0.637	−19** [−26.0,−6.0]
PC42	Seeks feedback	57	0.460	50	0.550	−7* [−17.5,4.5]
PC38	Setting reasonable personal learning objectives	58	0.432	60	0.471	2 [−11.5,9.0]
PC72	Engaging with evidence-based veterinary medicine	59	0.428	58	0.482	−1 [−15.5,5.0]
PC15	Attention to detail	60	0.427	67	0.399	7 [−5.0,16.0]
PC77	Appropriate knowledge of pharmacology and therapeutics	61	0.427	62	0.448	1 [−11.0,10.0]
PC36	Reading the preparation material provided	62	0.418	68	0.399	6 [−6.0,15.0]
PC44	Understanding what both formal and informal feedback looks like in the workplace	63	0.417	75	0.325	12* [1.0,20.0]
PC89	Able to use a formulary or product data sheets, and calculate drug doses	64	0.416	56	0.490	−8 [−15.0,3.5]
PC02	Students' awareness of the complex professional and cultural norms of the veterinary workplace	65	0.415	65	0.407	0 [−7.5,14.0]
PC53	Open to learning about species not of particular career interest	66	0.408	73	0.341	7 [1.5,20.0]
PC06	Students' awareness that there is variation between different workplaces	67	0.396	78	0.277	11** [3.0,22.0]
PC86	Basic clinical skills, for example, blood sampling, placing an intravenous catheter	68	0.381	53	0.529	−15** [−28.0,−6.0]
PC17	Timeliness	69	0.376	71	0.375	2 [−6.0,12.0]
PC39	Students' awareness of their expected learning outcomes (set by veterinary school or licensing body)	70	0.370	66	0.400	−4 [−12.0,4.5]
PC11	Diplomacy	71	0.368	79	0.274	8* [3.0,21.0]
PC76	Appropriate knowledge of anatomy	72	0.361	63	0.439	−9 [−13.0,4.0]

(Continues)

TABLE 4 (Continued)

Preparedness characteristic		Clinical supervisors		Veterinary students		Difference in ranking [95% CI]
Code	Name	Importance ranking	Importance rating	Importance ranking	Importance rating	
PC24	Students' awareness of the content of their licensing body's code of conduct (e.g., RCVS Code of Professional Conduct, AVMA Principles of Veterinary Medical Ethics)	73	0.353	69	0.396	−4 [−11.0,6.5]
PC03	Students' awareness that their supervisor holds two roles (veterinary surgeon and teacher), and these sometimes compete with each other	74	0.318	72	0.373	−2 [−10.0,3.5]
PC50	Animal advocate	75	0.304	59	0.474	−16** [−23.0,−10.0]
PC64	Written communication skills	76	0.301	83	0.219	7* [3.0,14.0]
PC79	Appropriate knowledge of animal husbandry and production systems	77	0.278	64	0.410	−13** [−18.0,−4.0]
PC27	Students' awareness of the variation in the caseload that they experience	78	0.237	80	0.268	2 [−6.0,5.0]
PC05	Students' awareness of the challenges associated with moving workplace clinical training location frequently	79	0.223	81	0.250	2 [−5.5,6.0]
PC88	Able to use diagnostic equipment, for example, use a microscope	80	0.222	74	0.327	−6* [−12.0,0.0]
PC04	Students' awareness of the commercial aspects of veterinary practice	81	0.199	87	0.112	6** [1.5,11.0]
PC18	Personal leadership over breaks and work patterns	82	0.183	82	0.246	0 [−8.5,4.0]
PC21	Bringing the correct equipment	83	0.160	84	0.203	1 [−6.0,5.0]
PC22	Familiarity with the environment, for example, where things are, how the computer system works	84	0.154	76	0.312	−8** [−15.0,−1.0]
PC20	Well-presented, wearing appropriate clothing	85	0.141	86	0.163	1 [−5.0,6.0]
PC25	Appropriate use of mobile phones and the internet	86	0.138	91	0.000	5** [1.0,10.0]
PC23	Able to get to and from workplace clinical training independently	87	0.116	89	0.033	2 [−1.0,9.0]
PC87	Surgical dexterity and tissue handling	88	0.101	85	0.179	−3 [−6.5,4.0]
PC81	Appropriate knowledge of the core vaccines for the principal domesticated species	89	0.089	77	0.295	−12** [−15.5,−3.5]
PC80	Appropriate knowledge of parasitology	90	0.030	90	0.012	0 [−2.0,4.0]
PC60	Telephone skills	91	0.000	88	0.062	−3 [−4.0,0.0]

Note: An interactive version of this table is available as Supporting Information S4, where the rows can be sorted according to any column value (e.g., by rank difference, supervisor rank, student rank, *p*-value).

The colour of the rank difference cell indicates the direction of the permutation test:

■ Supervisors ranked the preparedness characteristic higher than students (one-sided permutation test).

■ Students ranked the preparedness characteristic higher than supervisors (one-sided permutation test).

□ Two-sided permutation test.

Abbreviations: AVMA, American Veterinary Medical Association; RCVS, Royal College of Veterinary Surgeons.
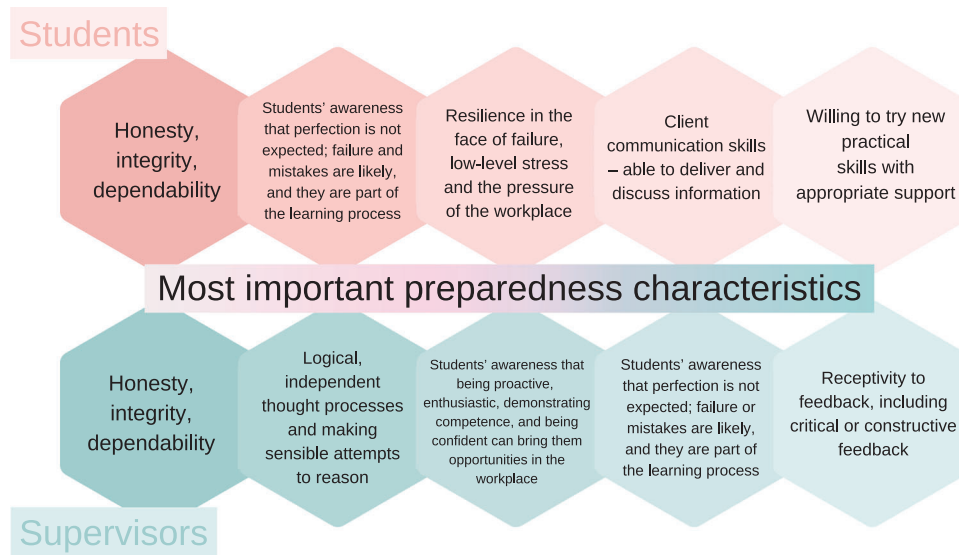
*$p < 0.05$.

**$p < 0.01$.

FIGURE 3   The five most important preparedness characteristics for veterinary workplace clinical training according to students and clinical supervisors
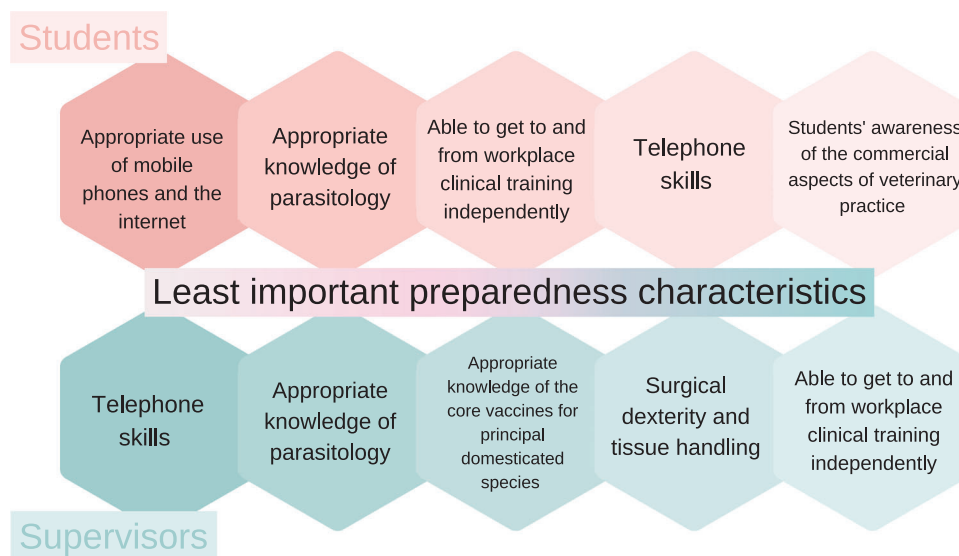

FIGURE 4   The five least important preparedness characteristics for veterinary workplace clinical training according to students and clinical supervisors

second most important by students and seventh by supervisors. There was a difference of nine ranks for the subtheme 'understanding how to gain opportunities for learning in the workplace' (ST9), which was ranked third most important by supervisors and 12th by students (Table 5).

Preparedness main theme ranking comparison

Participants were asked directly to rank the seven preparedness themes in order of importance for veterinary WCT. A rank of one signified the most important and seven the least. The distributions of responses in both groups are presented in Figure 5.

Mann–Whitney U-tests were performed to determine if the ranks for each theme were significantly different between the groups (Table 6). Students being prepared for self-directed and experiential learning while working (MT2) was ranked as significantly more important by supervisors than students ($p = 0.00021$). Students being prepared with a growth mindset (MT3) was ranked as significantly more important by students than supervisors ($p = 0.00001$).

DISCUSSION

A pairwise comparison-based survey was used to measure the perspectives of veterinary students and clinical supervisors on the relative importance of different student preparedness characteristics and themes. The survey was custom designed for this purpose[52] as a way to differentiate between characteristics that were all likely to be perceived as somewhat important.

TABLE 5 Overall rank of the preparedness subthemes, dictated by the median rank of the preparedness characteristics subsumed by each subtheme

Preparedness subtheme		Overall rank of subtheme, according to median rank of subsumed preparedness characteristics		
Code	Name	Clinical supervisors	Students	Rank difference
ST12	Learning to fail and failing in order to learn	1	1	0
ST22	Clinical application of knowledge	2	3	−1
ST9	How to gain opportunities for learning in the workplace	3	12	−9
ST8	Finding and filling knowledge gaps	4	4	0
ST20	Clinical reasoning for common cases	5	8	−3
ST26	Clinical examination skills	6	7	−1
ST24	Competence and confidence handling animals	7	2	5
ST10	Prepared for learning and working with peers	8	6	2
ST16	Enthusiasm	9	5	4
ST3	Roles and responsibilities	10	9	1
ST19	Communicating with clients	11	13	−2
ST7	An awareness that learning in the workplace should be an active and experiential process	12	10	2
ST2	Social and situational awareness	13	16	−3
ST15	Motivation	14	11	3
ST18	Communicating with the clinical team	15	14	1
ST14	Reflection skills	16	15	1
ST17	Appreciating transferability	17	19	−2
ST23	Knowing how is important	18	18	0
ST13	Engaging with feedback	19	17	2
ST11	Administration for learning through work	20	20	0
ST1	Aligning expectations of clinical practice with the reality	21	24	−3
ST4	Time management	22	23	−1
ST25	Basic clinical skills	23	21	2
ST21	The '-ologies'	24	22	2
ST6	Code of Professional Conduct	25	25	0
ST5	Practical aspects—equipment, transport and clothing	26	26	0

■ Supervisors ranked the subtheme higher than students.
■ Students ranked the subtheme higher than supervisors.
□ No difference in overall subtheme rank.

Rating such items using Likert scales would be susceptible to the 'ceiling effect'[58] and low measurement spread, limiting our ability to differentiate between them.

Both students and supervisors valued 'honesty, integrity and dependability' (PC13) highly, since both groups ranked the characteristic first. However, there was a notably large difference in the ratings of the first- and second-ranked characteristics for supervisors (0.131 for supervisors vs. 0.026 for students). This means that over one-tenth of the entire importance scale (from zero to one) was dedicated to the ranks of just two of the 91 characteristics. This demonstrates that the relative importance of honesty, integrity and dependability was greater for supervisors, which aligns with research demonstrating a lack of trustworthiness as an important differentiator of weak students from excellent and marginal WCT students for clinical supervisors[59] and that 'professional attitude' (which includes dependability) has the strongest effect on supervisors' assessment of students during WCT.[60] Supervisors are clinicians first and foremost, and their experience of professional practice may explain their perspective; honesty and integrity are critical for patient safety[61] and form one of the five principles of practice of the Royal College of Veterinary Surgeons.[62] Additionally, supervisors are evidently going to benefit from dependable students in their day-to-day work.

Honesty and integrity can be hard to define; they are easier to operationalise in terms of behaviours than conceptualise abstractly.[63] As values, they are likely to be formed at an early age, so selection for honesty and integrity at admission may be useful.[63] However, the hidden curriculum can be harnessed to foster students' professional identities with these traits.[64] Academics' role modelling throughout veterinary school is likely to be important for fostering academic honesty and integrity in students, which translates into the workplace.[61] Curriculum design may threaten
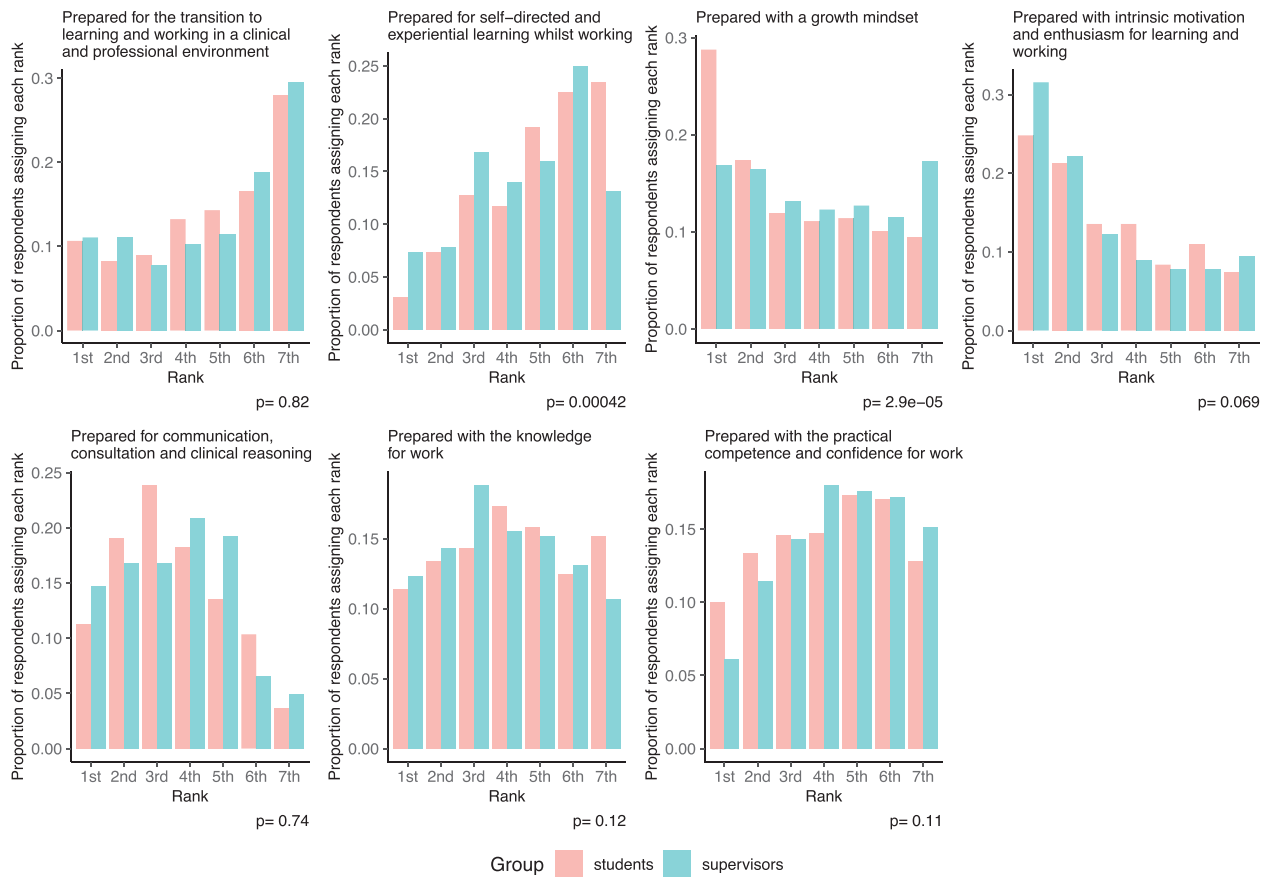
FIGURE 5 The proportion of participants in each group (students and clinical supervisors) attributing ranks to each preparedness theme. The *p*-value for the two-sided Mann–Whitney *U*-test is presented under each individual plot

TABLE 6 Median ranks of the main preparedness themes according to student and supervisor groups, Mann–Whitney *U*-test results to determine significant differences in the ranks between groups and Kendall's Tau-b correlation coefficients for the ranks of the subsumed preparedness characteristics in each main theme

Main theme		Median rank			Mann–Whitney *U*-test, *p*-value		Kendall's Tau-b correlation coefficient	
Code	Name	Clinical supervisors	Students	Difference	Two-sided test	One-sided test	R_τ	*p*-Value
MT4	Prepared with intrinsic motivation and enthusiasm for learning and working	2	3	−1	0.06942	NA	0.600	0.13611
MT6	Prepared with the knowledge for work	4	4	0	0.12089	NA	0.714	0.03016*
MT3	Prepared with a growth mindset	4	3	1	0.00003**	0.00001**	0.778	0.00243**
MT5	Prepared for communication, consultation and clinical reasoning	4	3	1	0.73551	NA	0.571	0.00016**
MT7	Prepared with the practical competence and confidence for work	4.5	4	0.5	0.11128	NA	0.611	0.02474*
MT1	Prepared for the transition to learning and working in a clinical and professional environment	5	5	0	0.81554	NA	0.853	6.47e-13**
MT2	Prepared for self-directed and experiential learning while working	5	5	0	0.00042**	0.00021**	0.670	0.00045**

*$p < 0.05$.
**$p < 0.01$.
■ Supervisors ranked the main theme higher than students.
■ Students ranked the main theme higher than supervisors.
□ No difference in median main theme rank.

students' academic integrity and should be carefully considered; information overload and inauthentic assessment can demotivate student learning and promote dishonest behaviour.[61]

The importance of preparedness related to self-directed and experiential methods of learning supports the notion of students as legitimate participants in a community of practice[65] and as adult learners.[66] The supervisors perceived this as important; 'prepared for self-directed and experiential learning while working' (MT2) was ranked significantly higher by supervisors, which correlates with similar findings in other health professions.[28,67,68]

Other results support the importance of being prepared for self-directed learning for supervisors. For example, 'understanding how to gain opportunities to learn' (ST9) ranked higher for this group (3/26 vs. 12/26 for students), and the following preparedness characteristics also ranked significantly higher: an awareness that being proactive, enthusiastic, demonstrating competence and confidence can bring them opportunities in the workplace (PC32); filling knowledge gaps (PC30); problem solving (PC71); and being proactive in seeking learning opportunities (PC33). It is possible that students perceive self-directed learning as less important because, in the context of a content-laden curriculum and high-stakes professional examinations, they have low preference for it and can find it frustrating and inefficient.[69,70] Nevertheless, mechanisms to enhance preparedness in this regard might include problem-based learning in the preclinical curriculum, which has been demonstrated to enhance readiness for medical clerkship,[71,72] and the use of portfolios/logbooks to support self-regulated learning.[73,74]

There was some evidence that practical skills were perceived as relatively more important by students. The preparedness characteristic 'willing to try new practical skills' (PC52) was ranked in the top five by students but only 26th by supervisors. Other characteristics ranked significantly higher by students were competence and confidence in handling animals (PC84), basic clinical skills (PC86) and working safely (PC85). However, the main theme 'prepared with the practical competence and confidence for work' (MT7) was not ranked significantly different by the groups. Nevertheless, these findings suggest that students anticipate WCT as a time when their practical skills will be implemented. Since preparedness can relate to more general emotional states or a feeling of being ready,[75] it is possible that students feel anxious about 'performing' their practical skills and therefore regard it as relatively more important. This is consistent with qualitative research demonstrating that veterinary students feel fear about their performance on rotations and apprehension about potentially negative or intimidating responses from clinicians.[76]

This study indicates that clinical supervisors place greater value on an appreciation of the nuances of clinical reasoning than students. It is rational that clinical supervisors might perceive clinical reasoning as something that's particularly challenging or have had experiences that indicate it is something students struggle with. The preparedness characteristics that supervisors ranked significantly higher than students were: having a clinical reasoning framework for common problems (PC65); students' awareness of uncertainty and risk in clinical decision making (PC74); able to assimilate and understand the importance of clinical information in the case (PC66); logical, independent thought processes (PC67); forming problem/differential lists (PC71); and an awareness that there is more than one way of doing something (PC75).

There are four components likely to be important for developing clinical reasoning skills in veterinary students: (1) explicit teaching about critical thinking and problem solving, (2) experiencing authentic reasoning in practice, (3) knowledge acquisition and (4) general non-clinical decision-making experience.[77] Using these components as foci for enhancing preparedness could be beneficial. Additionally, creating opportunities for students to take responsibility for decisions is likely to be important, albeit difficult to achieve.[77,78] There are many published interventions for enhancing clinical reasoning in medical students.[79] Using contextualised, standardised patient simulation improves self-assessed clinical reasoning in final-year veterinary students,[80] but can be introduced earlier in the curriculum with simpler cases.

Having a growth mindset[81] was valued by students, with the main theme 'prepared with a growth mindset' (MT3) being ranked significantly higher compared to supervisors. Additionally, the characteristic 'an awareness that perfection is not expected; failure or mistakes are likely, and they are part of the learning process' (PC40) was ranked second, and 'asking for help' (PC31) ranked significantly higher for students (6/91 vs. 23/91 for supervisors). There is preliminary evidence that students have a growth mindset,[82] and given that they are personally and actively engaged with the learning process, it is rational that these characteristics and themes have higher value for them. 'Learning to fail and failing in order to learn' (ST12) was the subtheme with the highest overall rank for both groups. This result suggests that it is important to create a zone of proximal development[83] in which students can try out authentic tasks and can safely fail in preparation for WCT. There is limited literature regarding mechanisms and interventions designed to allow students to fail,[84] although pre-prescribing has been adopted in HPE as one such mechanism.[85,86] This involves students writing authentic prescriptions for real patients in a clinical setting clearly identified as not authorised, usually using a coloured pen, which are subsequently checked, corrected and countersigned.

It is noteworthy that 'empathy, compassion and kindness' (PC61) and 'being an animal advocate' (PC50) were ranked significantly higher by students than supervisors. For clarity, that is not to say that

supervisors do not perceive these characteristics as important but simply that students perceived it to be relatively more so. In support of this, Norman[59] demonstrated that caring for animals was a theme that clinical supervisors used to distinguish excellent students from weak and marginal ones. Our results are in line with findings in medical education demonstrating that supervisors describe clerkship students with less emphasis on a caregiver profile (advocating for patients) compared to the students (describing themselves).[87]

The results of the present study could represent empathy erosion in the working part of our profession; 62% of clinical supervisors in this survey had more than 10 years of clinical experience. Some aspects of empathy decrease with clinical experience in practice,[88] and students might view qualified veterinarians as 'tough minded'.[89] It is also known that empathy decreases throughout the veterinary programme,[90,91] a phenomenon also recognised in Western medical education.[92] This decline is likely to be multifactorial, but it is understood that workplace learning impacts students' attitudes towards patients.[90,93] Evidently, students undergo a hardening of attitudes that coincides with exposure to practice, and this continues in their work life, possibly in order to cope with distress or conflict they might encounter. The students in this survey had not yet commenced their WCT; in other words, they were relatively naïve, which might be why they perceived empathy and animal advocacy as relatively more important than supervisors.

Relatedly, it is understood that medical professionals suffering from burnout have a smaller capacity to display empathy.[94] It is therefore notable that students also ranked 'an awareness of their own and others' mental wellbeing, and the importance of self-care' (PC48) as significantly more important than supervisors. Are students intensely aware of the challenges that they face during WCT? Does this finding reflect an underlying anxiety about the road ahead? Either way, students are evidently interested in the affective aspects of preparedness for WCT.

Limitations

There was a trade-off between gathering sufficient data by approaching many veterinary schools to take part and generating results that have external validity and are generalisable to a specific population. The result of using pooled survey data from a geographically wide variety of veterinary schools is that the preparedness characteristic rankings generated are not necessarily representative of the perspectives of respondents at any one institution.

Only veterinary schools that fulfilled the inclusion criteria were selected to participate in the study. To facilitate data collection, this included only schools in which the veterinary programme was delivered in English. This introduced some selection bias and, in practical terms, probably limits the generalisability of the results to Europe, North America and Australia.

Since local champions and individual participants volunteered to take part in the study, the survey is susceptible to volunteer bias if they are systematically different from the general target population. Additionally, it is not possible to calculate the response rate since the number of individuals who were sent the survey by local champions was not recorded. However, by evaluating the number of completed responses, it is evident that the contribution by some veterinary schools was very low. It is difficult to quantify the differences between non-responders and responders and the impact of non-response bias because limited information was available for those who did not take part.

The limitations of using a survey based on pairwise comparisons and the Elo algorithm are discussed in a companion methodology paper.[52]

Further work

Future studies could assess the perspectives of the academic staff preparing students for WCT, whether supervisors working in different clinical settings (e.g., specialty vs. primary care) differ in their perspectives and how supervisors themselves can be prepared for facilitating students' learning in the workplace.

CONCLUSION

Similarities and differences in the relative importance attributed to preparedness characteristics for veterinary WCT by students and clinical supervisors were determined in this study. The data presented provide educators, admission tutors and curriculum developers with new insights for focus in preparing students for WCT and indicate where perspectives between these stakeholder groups need to be reconciled.

CONFLICT OF INTEREST STATEMENT

The authors declare they have no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

The study was granted ethical approval by the University of Surrey Ethics Committee (FHMS 20-21 118 EGA) on 29 April 2021 with an amendment approved on 4 March 2022.

ORCID

Jennifer Routh https://orcid.org/0000-0002-4177-7452

Sharmini Julita Paramasivam https://orcid.org/0000-0003-1386-9840

Peter Cockcroft https://orcid.org/0000-0003-0090-0706

Sarah Wood https://orcid.org/0000-0003-2551-3040

John Remnant https://orcid.org/0000-0002-6745-845X

Cornélie Westermann https://orcid.org/0000-0002-0942-5860

Alison Reid https://orcid.org/0000-0001-9734-2143

Patricia Pawson https://orcid.org/0000-0002-3082-2561

Sheena Warman https://orcid.org/0000-0003-0829-2039

Vishna Devi Nadarajah https://orcid.org/0000-0002-7126-7189

Kamalan Jeevaratnam https://orcid.org/0000-0002-6232-388X

REFERENCES

1. Routh J, Paramasivam SJ, Cockcroft P, Nadarajah VD, Jeevaratnam K. Stakeholder perspectives on veterinary student preparedness for workplace clinical training—a qualitative study. BMC Vet Res. 2022;18(1):340.
2. Saadeh K, Aitken JB, Paramasivam SJ, Cockcroft P, Jeevaratnam K. Student perspectives of preparedness characteristics for clinical learning within a fully distributed veterinary teaching model. PLoS One. 2021;16(5):e0249669.
3. Cashman D, Rackard S. Learning through clinical extramural studies: an observational study. Ir Vet J. 2023;76(1):10.
4. Magnier K, Wang R, Dale VHM, Murphy R, Hammond RA, Mossop L, et al. Enhancing clinical learning in the workplace: a qualitative study. Vet Rec. 2011;169(26):682.
5. Routh J, Paramasivam SJ, Cockcroft P, Nadarajah VD, Jeevaratnam K. Using learning theories to develop a veterinary student preparedness toolkit for workplace clinical training. Front Vet Sci. 2022;9:1–14.
6. Sellberg M, Palmgren PJ, Möller R. Balancing acting and adapting: a qualitative study of medical students' experiences of early clinical placement. BMC Med Educ. 2022;22(1):659.
7. Teunissen PW. Experience, trajectories, and reifications: an emerging framework of practice-based learning in healthcare workplaces. Adv Health Sci Educ. 2015;20(4):843–56.
8. Dornan T, Bundy C. What can experience add to early medical education? Consensus survey. BMJ. 2004;329(7470):834.
9. Mossop L, Dennick R, Hammond R, Robbé I. Analysing the hidden curriculum: use of a cultural web. Med Educ. 2013;47(2):134–43.
10. Van Der Zwet J, Zwietering PJ, Teunissen PW, Van Der Vleuten CPM, Scherpbier AJJA. Workplace learning from a socio-cultural perspective: creating developmental space during the general practice clerkship. Adv Health Sci Educ. 2011;16(3):359–73.
11. Teunissen PW, Westerman M. Opportunity or threat: the ambiguity of the consequences of transitions in medical education. Med Educ. 2011;45(1):51–59.
12. Al Sattar A, Hoque A, Irin N, Charles D, Ciappesoni JL, Anwer MS, et al. Identifying benefits, challenges, and options for improvement of veterinary work-based learning in Bangladesh. J Vet Med Educ. 2022:e20220049.
13. Lefroy J, Yardley S, Kinston R, Gay S, McBain S, McKinley R. Qualitative research using realist evaluation to explain preparedness for doctors' memorable 'firsts'. Med Educ. 2017;51(10):1037–48.
14. Miller CW. Experiential learning in veterinary education. J Vet Med Educ. 1997;24:48–51.
15. Prince KJAH, Van De Wiel M, Scherpbier AJJA, Can Der Vleuten CPM, Boshuizen HPA. A qualitative analysis of the transition from theory to practice in undergraduate training in a PBL-medical school. Adv Health Sci Educ Theory Pract. 2000;5(2):105–16.
16. Van Hell EA, Kuks JBM, Schnrock-Adema J, Van Lohuizen MT, Cohen-Schotanus J. Transition to clinical training: influence of pre-clinical knowledge and skills, and consequences for clinical performance. Med Educ. 2008;42(8):830–37.
17. Morrison J, Moffat K. More on medical student stress. Med Educ. 2001;35(7):617–18.
18. Alexander DA, Haldane JD. Medical education: a student perspective. Med Educ. 1979;13(5):336–41.
19. Westerman M, Teunissen PW. Transitions in medical education. Oxford textbook of medical education. Oxford University Press; 2013.
20. Poncelet A, O'Brien B. Preparing medical students for clerkships: a descriptive analysis of transition courses. Acad Med. 2008;83(5):444–51.
21. Kilminster S, Zukas M, Quinton N, Roberts T. Preparedness is not enough: understanding transitions as critically intensive learning periods. Med Educ. 2011;45(10):1006–15.
22. Tran M, Wearne S, Tapley A, Fielding A, Davey A, Van Driel M, et al. Transitions in general practice training: quantifying epidemiological variation in trainees' experiences and clinical behaviours. BMC Med Educ. 2022;22(1):124.
23. Teunissen PW, Watling CJ, Schrewe B, Asgarova S, Ellaway R, Myers K, et al. Contextual competence: how residents develop competent performance in new settings. Med Educ. 2021;55(9):1100–1109.
24. Roop SA, Pangaro L. Effect of clinical teaching on student performance during a medicine clerkship. Am J Med. 2001;110(3):205–9.
25. Gordon J, Hazlett C, Ten Cate O, Mann K, Kilminster S, Prince K, et al. Strategic planning in medical education: enhancing the learning environment for students in clinical settings. Med Educ. 2000;34(10):841–50.

26. Billett S. Student readiness and the integration of experiences in practice and education settings. Technical and vocational education and training: issues, concerns and prospects. Dordrecht: Springer; 2018. p. 19–40.

27. Mandese W, Feng X, Behar-Horenstein L. Student experiences in practice-based small animal clerkships. J Vet Med Educ. 2019;46(3):372–78.

28. Chipchase LS, Buttrum PJ, Dunwoodie R, Hill AE, Mandrusiak A, Moran M. Characteristics of student preparedness for clinical learning: clinical educator perspectives using the Delphi approach. BMC Med Educ. 2012;12:112.

29. Spiliotopoulou G. Preparing occupational therapy students for practice placements: initial evidence. Br J Occup Ther. 2007;70(9):384–88.

30. Virtue SM, Pendergast L, Tellez M, Waldron E, Ismail A. Identifying noncognitive skills that contribute to dental students' success: dental faculty perspectives. J Dent Educ. 2017;81(3):300–309.

31. Morrell N, Ridgway V. Are we preparing student nurses for final practice placement? Br J Nurs. 2014;23(10):518–23.

32. Reisbig AMJ, Danielson JA, Wu T-F, Hafen M, Krienert A, Girard D, et al. A study of depression and anxiety, general health, and academic performance in three cohorts of veterinary medical students across the first three semesters of veterinary school. J Vet Med Educ. 2012;39(4):341–58.

33. Jarecke JL, Taylor EW, Gusic ME. Faculty and student perceptions of readiness for clinical clerkships. Med Sci Educ. 2013;23(1):47–54.

34. Hashizume CT, Myhre DL, Hecker KG, Bailey JV, Lockyer JM. Exploring the teaching motivations, satisfaction, and challenges of veterinary preceptors: a qualitative study. J Vet Med Educ. 2016;43(1):95–103.

35. Sturman N, Régo P, Dick M-L. Rewards, costs and challenges: the general practitioner's experience of teaching medical students. Med Educ. 2011;45(7):722–30.

36. Kilminster SM, Jolly BC. Effective supervision in clinical practice settings: a literature review. Med Educ. 2000;34(10):827–40.

37. Farrell L, Bourgeois-Law G, Buydens S, Regehr G. Your goals, my goals, our goals: the complexity of coconstructing goals with learners in medical education. Teach Learn Med. 2019;31(4):370–77.

38. Brammer JD. RN as gatekeeper: student understanding of the RN buddy role in clinical practice experience. Nurse Educ Today. 2006;26(8):697–704.

39. Wenrich M, Jackson MB, Scherpbier AJ, Wolfhagen IH, Ramsey PG, Goldstein EA. Ready or not? Expectations of faculty and medical students for clinical skills preparation for clerkships. Med Educ Online. 2010;15.

40. Judd B, Brentnall J, Scanlan JN, Thomson K, Blackstock F, Mandrusiak A, et al. Evaluating allied health students' readiness for placement learning. BMC Med Educ. 2023;23(1):70.

41. Peters S, Clarebout G, Van Nuland M, Aertgeerts B, Roex A. A qualitative exploration of multiple perspectives on transfer of learning between classroom and clinical workplace. Teach Learn Med. 2018;30(1):22–32.

42. Orpin P, Parker A. Improving extramural studies. Vet Rec. 2022;191(10):423.

43. Reid AS, Noble K, editors. "Black Monday": evaluating rotation readiness in final year veterinary students (a pilot study). VetEd Symposium, Cambridge. 2015.

44. Peters S, Clarebout G, Aertgeerts B, Michels N, Pype P, Stammen L, et al. Provoking a conversation around students' and supervisors' expectations regarding workplace learning. Teach Learn Med. 2020;32(3):282–93.

45. Cake MA, Bell MA, Williams JC, Brown FJL, Dozier M, Rhind SM, et al. Which professional (non-technical) competencies are most important to the success of graduate veterinarians? A Best Evidence Medical Education (BEME) systematic review: BEME Guide No. 38. Med Teach. 2016;38(6):550–63.

46. Gilling ML, Parkinson TJ. The transition from veterinary student to practitioner: a "make or break" period. J Vet Med Educ. 2009;36(2):209–15.

47. Reinhard AR, Hains KD, Hains BJ, Strand EB. Are they ready? Trials, tribulations, and professional skills vital for new veterinary graduate success. Front Vet Sci. 2021;8: 785844.

48. Cary JA, Farnsworth CH, Gay J, Carroll HS. Stakeholder expectations regarding the ability of new veterinary graduates to perform various diagnostic and surgical procedures. J Am Vet Med Assoc. 2017;251(2):172–84.

49. Cobb KA, Brown GA, Hammond RH, Mossop LH. Alumni-based evaluation of a novel veterinary curriculum: are Nottingham graduates prepared for clinical practice? Vet Rec Open. 2015;2(2):e000116.

50. Hardin LE, Ainsworth JA. An alumni survey to assess self-reported career preparation attained at a US veterinary school. J Vet Med Educ. 2007;34(5):683–88.

51. Schull D, Morton J, Coleman G, Mills P. Final-year student and employer views of essential personal, interpersonal and professional attributes for new veterinary science graduates. Aust Vet J. 2012;90(3):100–104.

52. Routh J, Paramasivam SJ, Cockcroft P, Wood S, Remnant J, Westermann C, et al. Rating and ranking preparedness characteristics important for veterinary workplace clinical training: a novel application of pairwise comparisons and the Elo algorithm. Front Med. 2023;10:1–16.

53. Han J, Kamber M, Pei J. Data Preprocessing. In: Han J, Kamber M, Pei J, editors. Data mining: concepts and techniques. 3rd ed. Boston: Morgan Kaufmann; 2012. p. 83–124.

54. Efron B, Tibshirani RJ. An introduction to the bootstrap. Dordrecht: Springer—Science + Business Media; 1993.

55. Robinson D, Edwards M, Mason B, Cockett J, Graham KA, Martin A. The 2019 survey of the veterinary profession. A report for the Royal College of Veterinary Surgeons. Institute for Employment Studies; 2019.

56. Schober P, Boer C, Schwarte LA. Correlation coefficients: appropriate use and interpretation. Anesth Analg. 2018;126(5):1763–68.

57. Botsch R. Chapter 12: significance and measures of association. Scopes and methods of political science. 2011. Available from: http://polisci.usca.edu/apls301/Text/Chapter%2012.%20Significance%20and%20Measures%20of%20Association.htm. Accessed 22 February 2023.

58. Vogt PW. Dictionary of statistics & methodology. 3rd ed. London: SAGE Publications Inc.; 2005.

59. Norman EJ. Supervisor descriptions of veterinary student performance in the clinical workplace: a qualitative interview study. Vet Rec. 2017;180(23):570.

60. Norman EJ. Assessing veterinary students using in-training evaluation scores: what is being assessed? Vet Rec. 2019;184(18):557.

61. Lynch J, Glew P, Salamonson Y, Ramjan LM. "Integrity is integrity. It doesn't matter the context": a qualitative exploratory study of academic integrity in an undergraduate nursing program. Teach Learn Nurs. 2022;17(4):465–70.

62. Royal College of Veterinary Surgeons. Code of professional conduct for veterinary surgeons. 2021. Available from: https://www.rcvs.org.uk/setting-standards/advice-and-guidance/code-of-professional-conduct-for-veterinary-surgeons/. Accessed 5 February 2021.

63. Hazelton LD. Conceptualizing and operationalizing honesty and integrity in postgraduate medical education. Acadia University; 2013.

64. Kumar Ghosh S, Kumar A. Building professionalism in human dissection room as a component of hidden curriculum delivery: a systematic review of good practices. Anat Sci Educ. 2019;12(2):210–21.

65. Lave J, Wenger E. Situated learning: legitimate peripheral participation. Cambridge University Press; 1991.

66. Knowles MS, Holton EF, Swanson RA. A theory of adult learning: andragogy. The adult learner. Hoboken, NJ: Taylor and Francis; 2012. p. 59–69.

67. Bayoumy HM, Shaqiqi WA, Bogami NA. Exploring importance of professional attributes of nurse students as prior indicators of preparedness for successful clinical education. Int J Nurs Clin Pract. 2015;2(2):127.

68. Banneheke H, Nadarajah VD, Ramamurthy S, Sumera A, Ravindranath S, Jeevaratnam K, et al. Student preparedness

characteristics important for clinical learning: perspectives of supervisors from medicine, pharmacy and nursing. BMC Med Educ. 2017;17(1):130.

69. Blumberg P. Why self-directed learning is not learned and practised in veterinary education. J Vet Med Educ. 2005;32(3):290–95.

70. Lunyk-Child OI, Crooks D, Ellis PJ, Ofosu C, O'Mara L, Rideout E. Self-directed learning: faculty and student perceptions. J Nurs Educ. 2001;40(3):116–23.

71. White CB. Smoothing out transitions: how pedagogy influences medical students' achievement of self-regulated learning goals. Adv Health Sci Educ Theory Pract. 2007;12(3):279–97.

72. Beck S, Schirlo C, Breckwoldt J. How the start into the clinical elective year could be improved: qualitative results and recommendations from student interviews. GMS J Med Educ. 2018;35(1):10.

73. Dale VHM, Pierce SE, May SA. Benefits and limitations of an employer-led, structured logbook to promote self-directed learning in the clinical workplace. J Vet Med Educ. 2013;40(4):402–18.

74. Van Der Gulden R, Timmerman A, Muris JWM, Thoonen BPA, Heeneman S, Scherpbier-de Haan ND. How does portfolio use affect self-regulated learning in clinical workplace learning: what works, for whom, and in what contexts? Perspect Med Educ. 2022;11(5):247–57.

75. Burford B, Vance G. When I say … preparedness. Med Educ. 2014;48(9):849–50.

76. Stone AES, Conner BJ, Behar-Horenstein LS, Mallicote M, Wuerz JA. Making connections: veterinary medicine student perceptions' of clinical readiness. J Ethnographic Qual Res. 2017;11:243–56.

77. Vinten CEK, Cobb KA, Freeman SL, Mossop LH. An investigation into the clinical reasoning development of veterinary students. J Vet Med Educ. 2016;43(4):398–405.

78. Vandeweerd J-M, Vandeweerd S, Gustin C, Keesemaecker G, Cambier C, Clegg P, et al. Understanding veterinary practitioners' decision-making process: implications for veterinary medical education. J Vet Med Educ. 2012;39(2):142–151.

79. Torre D, Chamberland M, Mamede S. Implementation of three knowledge-oriented instructional strategies to teach clinical reasoning: self-explanation, a concept mapping exercise, and deliberate reflection: AMEE Guide No. 150. Med Teach. 2023;45(7):676–84.

80. Vinten CEK, Cobb KA, Mossop LH. The use of contextualized standardized client simulation to develop clinical reasoning in final-year veterinary students. J Vet Med Educ. 2020;47(1):56–68.

81. Dweck CS. Mindset: changing the way you think to fulfil your potential. 6th ed. London: Robinson; 2017.

82. Root Kustritz MV. Pilot study of veterinary student mindset and association with academic performance and perceived stress. J Vet Med Educ. 2017;44(1):141–46.

83. Vygotsky LS. Mind in society: the development of higher psychological processes. Harvard University Press; 1980.

84. Klasen JM, Lingard LA. Allowing failure for educational purposes in postgraduate clinical training: a narrative review. Med Teach. 2019;41(11):1263–69.

85. Gillespie H, Reid H, Conn R, Dornan T. Pre-prescribing: creating a zone of proximal development where medical students can safely fail. Med Teach. 2022;44(12):1385–91.

86. Kinston R, McCarville N, Hassell A. The role of purple pens in learning to prescribe. Clin Teach. 2019;16(6):598–603.

87. O'Brien BC, Hirsh D, Krupat E, Batt J, Hansen LA, Poncelet AN, et al. Learners, performers, caregivers, and team players: descriptions of the ideal medical student in longitudinal integrated and block clerkships. Med Teach. 2016;38(3):297–305.

88. Schoenfeld-Tacher RM, Shaw JR, Meyer-Parsons B, Kogan LR. Changes in affective and cognitive empathy among veterinary practitioners. J Vet Med Educ. 2017;44(1):63–71.

89. O'Farrell V. Students stereotypes of owners and veterinary surgeons. Vet Rec. 1990;127(25–26):625.

90. Pollard-Williams S, Doyle RE, Freire R. The influence of workplace learning on attitudes toward animal welfare in veterinary students. J Vet Med Educ. 2014;41(3):253–57.

91. Schoenfeld-Tacher RM, Kogan LR, Meyer-Parsons B, Royal KD, Shaw JR. Changes in students' levels of empathy during the didactic portion of a veterinary program. J Vet Med Educ. 2015;42(3):194–205.

92. Ponnamperuma G, Yeo SP, Samarasekera DD. Is empathy change in medical school geo-socioculturally influenced? Med Educ. 2019;53(7):655–65.

93. Hojat M, Vergare MJ, Maxwell K, Brainard G, Herrine SK, Isenberg GA, et al. The devil is in the third year: a longitudinal study of erosion of empathy in medical school. Acad Med. 2009;84(9):1182–91.

94. Brown MEL, MacLellan A, Laughey W, Omer U, Himmi G, Lebon T, et al. Can stoic training develop medical student empathy and resilience? A mixed-methods study. BMC Med Educ. 2022;22(1):340.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.