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The definitive version is available at:

<http://dx.doi.org/10.3138/jvme.1215-191R>

Freire, R., Phillips, C.J.C., Verrinder, J.M., Collins, T., Degeling, C., Fawcett, A., Fisher, A.D., Hazel, S., Hood, J., Johnson, J., Lloyd, J.K.F., Stafford, K., Tzioumis, V. and McGreevy, P.D. (2017) The importance of animal welfare science and ethics to veterinary students in Australia and New Zealand. *Journal of Veterinary Medical Education*, 44 (2). pp. 208-216.

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The Importance of Animal Welfare Science and Ethics to Veterinary Students in Australia and New Zealand

Rafael Freire ■ Clive J. C. Phillips ■ Joy M. Verrinder ■ Teresa Collins ■ Chris Degeling ■ Anne Fawcett ■ Andrew D. Fisher ■ Susan Hazel ■ Jennifer Hood ■ Jane Johnson ■ Janice K. F. Lloyd ■ Kevin Stafford ■ Vicky Tzioumis ■ Paul D. McGreevy

ABSTRACT

The study of animal welfare and ethics (AWE) as part of veterinary education is important due to increasing community concerns and expectations about this topic, global pressures regarding food security, and the requirements of veterinary accreditation, especially with respect to Day One Competences. To address several key questions regarding the attitudes to AWE of veterinary students in Australia and New Zealand (NZ), the authors surveyed the 2014 cohort of these students. The survey aimed (1) to reveal what AWE topics veterinary students in Australia and NZ consider important as Day One Competences, and (2) to ascertain how these priorities align with existing research on how concern for AWE relates to gender and stage of study. Students identified triage and professional ethics as the most important Day One Competences in AWE. Students ranked an understanding of triage as increasingly important as they progressed through their program. Professional ethics was rated more important by early and mid-stage students than by senior students. Understanding the development of animal welfare science and perspectives on animal welfare were rated as being of little importance to veterinary graduates as Day One Competences, and an understanding of “why animal welfare matters” declined as the students progressed through the program. Combined, these findings suggest that veterinary students consider it more important to have the necessary practical skills and knowledge to function as a veterinarian on their first day in practice.

Key words: animal welfare education, Day One Competences, veterinary ethics

INTRODUCTION

The study of animal welfare and ethics (AWE) as part of veterinary education is important for several reasons. Public concern about AWE is increasing,^{1,2} with growing knowledge of AWE evident in reviews of animal welfare standards and guidelines, at least for nations that are members of the Organisation for Economic Co-operation and Development (OECD).^{3,4} There are also demands on graduates to be leaders in, and ambassadors for, animal welfare and ethical food production in connection with global imperatives for food security and sustainability of production systems. Further, veterinarians are professional scientists who work in direct contact with animals and, as such, have professional obligations to a range of stakeholders concerned with animal welfare, including the animals themselves.⁵ Finally, a practical understanding of AWE is increasingly likely to be mandated through accreditation of undergraduate veterinary programs, with the Royal College of Veterinary Surgeons (RCVS) Day One Competences already requiring students to possess AWE skills.⁶

Education in AWE has developed rapidly as a scientific discipline that deserves a central role in veterinary education.³ Animal welfare education is usually presented as a multidisciplinary subject linked to related topics in animal behavior, ethics, legislation, professional responsibilities, and socioeconomics.⁷ A structured curriculum usually provides scientific evidence and ethical discussion of animal welfare, but can also include a broader range of topics such as regulatory, professional, and philosophical subjects.⁸

Teaching and learning in AWE are particularly important for veterinary students as developing ethical skills may assist in dealing with the psychological work-related challenges veterinarians experience.^{9,10} For instance, research undertaken on veterinary students at the University of Queensland Australia suggests that those students who understand and appeal to ethical norms for guidance in decision making are less likely to suffer moral distress.¹¹ Engaging veterinary students in interactive activities based on moral development theory and ethical decision making can develop their moral judgment skills,¹² and may help to counter the desensitization of students during their veterinary training.^{13,14} Similar research in the

1. The Development of Animal Welfare Science

Animal welfare science is a relatively new scientific discipline that strives to provide rigorous scientific evidence to assess the welfare state of an animal. Although animal welfare science has made advances in areas such as the assessment of welfare, there are some key underlying concepts that remain difficult to study. Concepts such as the “5 freedoms” or the more recent “5 domains” have proved useful in advancing our understanding of key concepts in animal welfare. Clearly, other concepts, such as “animal needs,” “sentience,” and “suffering” have important roles in animal welfare and are worthy of scientific inquiry, though advancing our understanding of these concepts is challenging.

2. Reasons Why Animal Welfare Matters

Apart from a desire to be confident that the way we treat animals is not deleterious to their welfare, veterinarians and other animal science professionals are faced with increasing public concern for the welfare of animals. As a result, veterinarians are increasingly required to understand and occupy a unique role as “animal advocates.” This requires considerable knowledge of the impact of animal care and veterinary practice on animal welfare, and an ability to consider the often different interests of animals and humans.

3. Science versus Values (the Merits of an Evidence-Based Approach versus One’s Own Values in Making Decisions)

Unlike some of the other sciences underpinning veterinary science, animal welfare science arose from public concern around the treatment of animals. As a consequence, it is not merely an academic discipline arising from a topic of inquiry but rather a topic that people want to understand. Because of this, it is important to remember that animal welfare science may shift its focus and areas of study as new demands and questions arise about how animals should be treated. The value of scientific evidence, even in the face of such shifting emphasis, provides a valuable resource in decision making.

4. Applied Animal Ethics (Framework to Guide Ethical Practice Taking into Account All Stakeholders)

At a basic level, most people working with animals want to know how we should treat animals and what amounts to rightful versus wrongful treatment. Applied animal ethics is the domain in which we can explore the goal of the most defensible use of and treatment of animals. Central to this is the nature of the human–animal relationship, along with ethical awareness, knowledge of ethical frameworks, skills in ethical decision making, ethical motivation, and implementation.

5. Professional Ethics (Ethical Responsibilities of a Veterinarian)

Professional ethics deals with the provision of veterinary services that uphold the values of the profession in terms of its responsibilities to animals and society. It can require considerable and lengthy debate and judgement, and also has very pressing clinical applications on a day-to-day basis.

6. Laws and Regulations Regarding Animal Welfare

Animal welfare science research and ethical analysis may combine to provide evidence that may result in the formulation of standards in the form of legislation or codes of practice. There is currently a debate about the principles, content, and outcomes of regulation of animal welfare. It is an area of regulation that is contested by different stakeholders such as animal industries and animal advocates. In addition, veterinary practice is regulated by various codes and standards, which, in turn, reflect the concerns and ethos of the veterinary profession.

7. Perspectives on Welfare

As animal welfare science developed, it quickly became evident that different people held different views on what they felt mattered most to animals. For some, the health of the animal was paramount, while for others, physiologic homeostasis, behavioral expression, or subjective experiences were most important. These different views still persist and are an integral part of understanding that animal welfare is not purely a scientific discipline, but rather is an attempt to address what people want to know and consider important in the way we treat animals.

8. Human–Animal Bond

Also referred to as human–animal interaction (HAI), HAI is a field of study focusing on the mutual and dynamic relationship between people and animals. These interactions have important physical and psychological effects on both the animals and people and have important implications for animal welfare.

9. Triage (Systematic Protocol to Establish Urgency and Severity and to Differentiate between Emergencies and Routine Cases)

Triage is a tool to help veterinarians prioritize treatment in emergency situations and involves rapid assessment and designating to further treatment options, and can considerably alleviate animal suffering.

10. Euthanasia

Derived from the Greek word meaning “good death,” euthanasia is the practice of humanely ending the life of an animal that is irremediably and severely suffering. Methods must cause rapid loss of consciousness without recovery and cause minimal pain and/or distress to the animals. It is also important that euthanasia methods not pose unreasonable risks or cause unnecessary distress to the veterinary practitioner.

Table 1: Schedule for recruiting participants from institutions participating in this survey and response rate

Institution	Email l	Closing date	Number of students	Number of responses	Response percentage
The University of Sydney	10/9/14	11/7/14	600	147	24.5
Massey University	10/9/14	11/7/14	500	141	28.2
James Cook University	10/10/14	11/7/14	350	91	26.0
Charles Sturt University	10/16/14	11/7/14	295	84	28.5
The University of Queensland	10/10/14	11/7/14	609	68	11.1
The University of Adelaide	10/15/14	11/7/14	317	119	37.5
The University of Melbourne	10/17/14	11/7/14	259*	52	20.0
Murdoch University	10/22/14	11/14/14	390	116	29.7
Total			3,320	851[†]	25.6%

* Only first- and second-year students surveyed

† 851 students answered at least one question

medical profession shows that small-group discussion of case studies improves students' moral reasoning about ethical issues.¹⁵ Role modeling has also been shown to be effective in teaching virtue ethics in medical students.¹⁶

Veterinary students can adopt a variety of different roles when seeking to balance the interests of owners and their animals, including as advisors, service providers, advocates, or principled actors.^{17,18} However, a recent Australian study suggested that, with respect to moral motivation, veterinary students often believe that as veterinarians they should address animal protection issues and uphold the interests of the animal over those of the owner/caregiver.¹¹ In addition to these beliefs, Main⁷ considers that veterinary students expect to learn the knowledge and skills to address animal ethics issues during their veterinary training.

Although there is growing awareness among educators about the importance of AWE education for veterinary students, it is unclear what AWE topics students consider important for their careers. An important concept in veterinary education is that of Day One Competences,⁶ many of which relate to AWE. However, it is currently unknown which AWE topics veterinary students consider the most important, and if these opinions vary with gender or stage of education. To address this, the authors surveyed students currently enrolled in veterinary medical programs in Australia and NZ. Ten AWE topics were selected for inclusion in the questionnaire following polling of leaders in AWE education from each of the eight veterinary science schools in Australia and NZ. These topics are described in Box 1.

The present study also examined the influence of gender and stage of study on the importance of these topics to students. Gender is a major driver of attitudes toward animals generally, including in veterinary students.¹⁹ Female students are more likely than male students to rely on principled reasoning and less on personal interest,^{11,12} potentially enabling them to diminish moral distress. Thus, it is clear that female and male students differ in their approach to animal ethics and some topics may also become more important to students the closer they are to graduating.

The survey aimed (1) to reveal what AWE topics veterinary students in Australia and NZ consider to be important as Day One Competences, and (2) to ascertain how these priorities align with existing research on how concern for AWE relates to gender and stage of study.

METHOD

Study Participants

All students enrolled in veterinary science or veterinary medicine undergraduate or post-graduate programs at universities in Australia and NZ during October 2014 were invited to participate in the survey. The University of Sydney Human Ethics Committee and all participating universities granted institutional human ethics approval before the start of data gathering (approval number: 2014/739).

Questionnaire

Attendees at a 2-day workshop of AWE leaders from each of the veterinary schools in Australia and NZ, which was held at the University of Sydney in April 2014, developed and ranked a list of AWE questions and topics for the questionnaire.

The questionnaire sought essentially quantitative responses and was designed to explore the opinions of students regarding their priorities for the agreed AWE topics. The survey system SurveyMonkey (www.surveymonkey.com) was used to administer the online-only questionnaire from October 9 to November 14, 2014. Voluntary participation of students was sought via three emails sent a week apart, each of which included a link to the questionnaire. The link was closed approximately one week after the final reminder (see Table 1 below). An award of \$200 to the representative student body at the institution with the highest participation rate provided an incentive for students to complete the survey.

The first four questions concerned consent to participate and student demographics (i.e., university, gender, and year of study) and were single-answer multiple-choice questions. Students were then asked to identify the type of work they expected to undertake upon graduation.

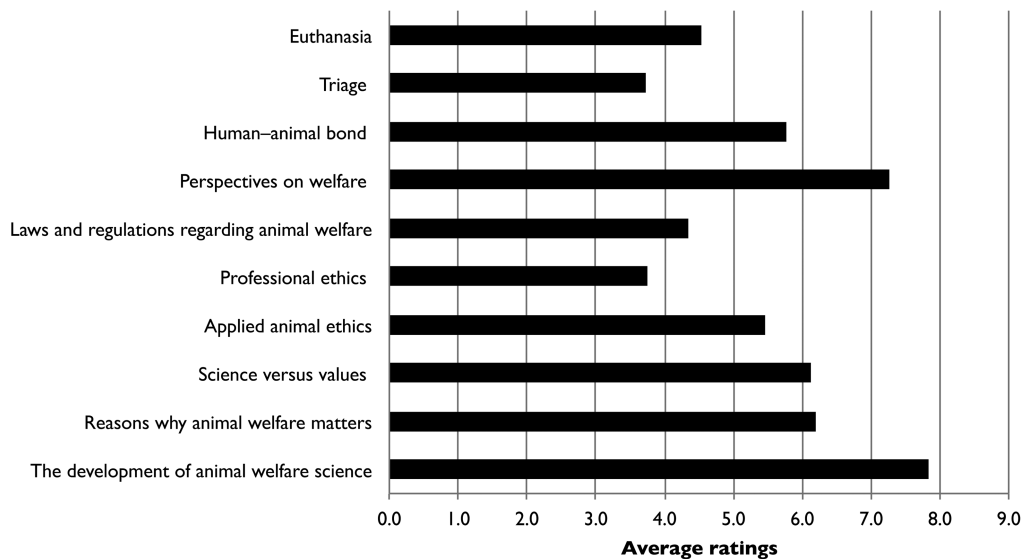


Figure 1: Average ratings in answer to the question “How important is an understanding of the following topics for veterinarians on their first day in practice?” (1 = extremely important, 10 = least important)

The following seven sections listed AWE topics under themes with one General Practice theme and six Specific Animal Use themes: Production Animals, Companion Animals, Wild Animals, Aquatic Animals, Animals Kept for Scientific Purposes, and Animals Used in Sport and Recreation. This study presents the results from the General Practice theme only.

In this theme, students were asked to rank 10 AWE topics using a 10-point Likert scale from *extremely important* (1) to *least important* (10) to indicate how important an understanding of each topic is for veterinarians on their first day of practice. The 10 General Practice topics are presented in Box 1.

Data Management

Given some differences in program structure across the universities surveyed, the responses to the question that asked students to identify their year of study were re-coded with years 1 and 2 as early students, years 3 and 4 as mid-stage students, and years 5 and 6 as senior students. The question that asked students the type of work they expected to undertake upon graduation permitted one or more responses and, therefore, the percentage of students expressing an interest in a particular type of work was expressed as a percentage of the total number of responses.

Statistical Analysis

All data were checked for errors and the cleaned data were entered into GenStat Version 15 (VSN International, Hemel Hempstead, UK). Log-linear modeling was used to analyze the three-way contingency tables of frequencies associated with (1) gender and (2) stage of study. Log-linear modeling relies on expected frequencies that are not too small, generally not less than 1, and not too many between 1 and 5. Given there were fewer than 20

males in the senior years of study across all universities, this presented a problem when analyzing the responses to the “professional ethics” and “perspectives on welfare” statements. To avoid this problem, scores of 6 or more for the above two statements were combined for the analysis, but plots in this report are based on the percentages of all scores.

RESULTS

Student Demographics

Of the 3,320 students emailed, 851 (25.6%) participated in the survey (Table 1). There were 671 (79%) females, 145 (17%) males, and 35 (4%) people who did not complete the gender item. Upon graduation, the majority of students expressed a desire to work in mixed (30.1%) or companion-animal practice (25.2%), with the remainder selecting production-animal practice (10.0%), exotic-animal practice (9.4%), equine practice (7.6%), research (5.1%), government work (5.4%), or “don’t know” (4.8%).

Student-Rated Importance of Topics

Students rated triage (having a systematic protocol to establish urgency and severity and to differentiate between emergencies and routine cases), and professional ethics (the ethical responsibilities of a veterinarian) as the two most important topics for their first day in practice (Figure 1). Understanding the development of animal welfare science and perspectives on welfare were rated as the least important topics for a newly graduated veterinarian.

Effect of Stage of Program and Gender on Student-Rated Importance of Topics

Triage scores were significantly influenced by stage of study (Table 2), being rated more important by senior

Table 2: *P* values obtained from log-linear model on the effect of gender and stage of program on scores for each question, and the interaction of the two factors

Topic	<i>P</i> value for factors (degrees of freedom)		
	Stage/gender interaction (18)	Stage (18)	Gender (9)
The development of animal welfare science	.16	.16	.12
Reasons why animal welfare matters	.10	.02	.88
Science versus values (the merits of an evidence-based approach versus one's own values in making decisions)	.88	.84	.09
Applied animal ethics (framework to guide ethical practice taking into account all stakeholders)	.35	.15	.29
Professional ethics (ethical responsibilities of a veterinarian)	.07 ^a	.008*	.53 [†]
Laws and regulations regarding animal welfare	.16	.30	.26
Perspectives on welfare (e.g., international/trade, consumer, marketer, regulator)	< .001*		
Human–animal bond (e.g., strength, emotional attachment).	.82	.23	.002
Triage (systematic protocol to establish urgency and severity and differentiate between emergencies and routine cases)	.29	.002	.14
Euthanasia	.49	.11	.80

* *df* = 10

† *df* = 5

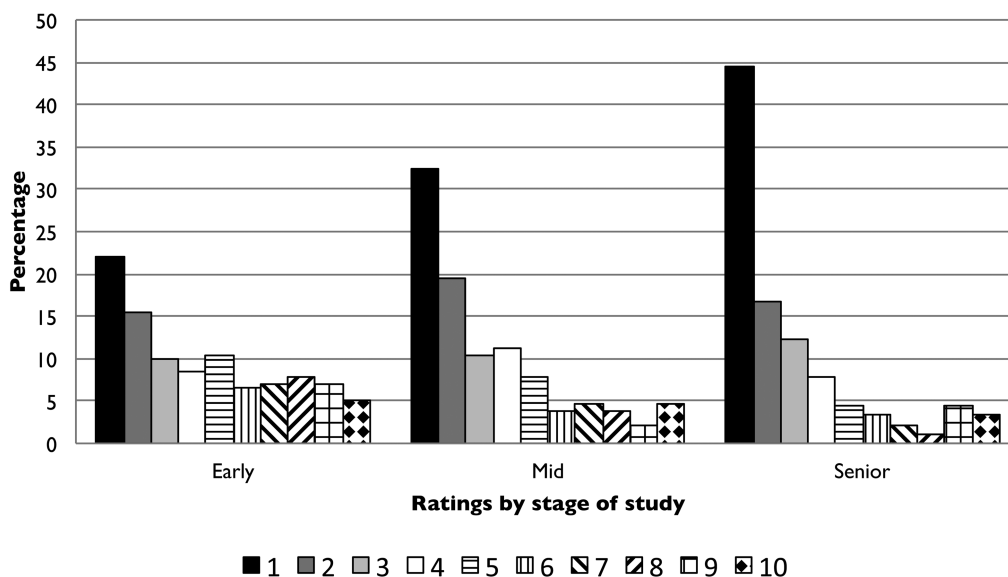


Figure 2: Ratings assigned by students from the early, mid-, and senior stages of study to the importance of an understanding of triage on their first day in practice (1 = extremely important, 10 = least important)

students, lower by mid-stage students, and lower still by early students (Figure 2). Having an understanding of the reasons why animal welfare matters was rated as less important by senior students than those in their early or mid-stage years (mean scores of 5.90, 6.27, and 6.78 respectively, $p = .02$).

Professional ethics was the second most important topic, rated more important by early and mid-stage students

(3.6 ± 0.2 and 3.7 ± 0.2 , respectively) than by senior students (4.1 ± 0.4) (Table 2). The importance of the human–animal bond was found to vary significantly between males and females (Table 2), with female students rating this as a more important topic for their first day in practice than male students (mean scores of 5.59 ± 0.2 and 6.64 ± 0.6 , respectively, $p = .002$).

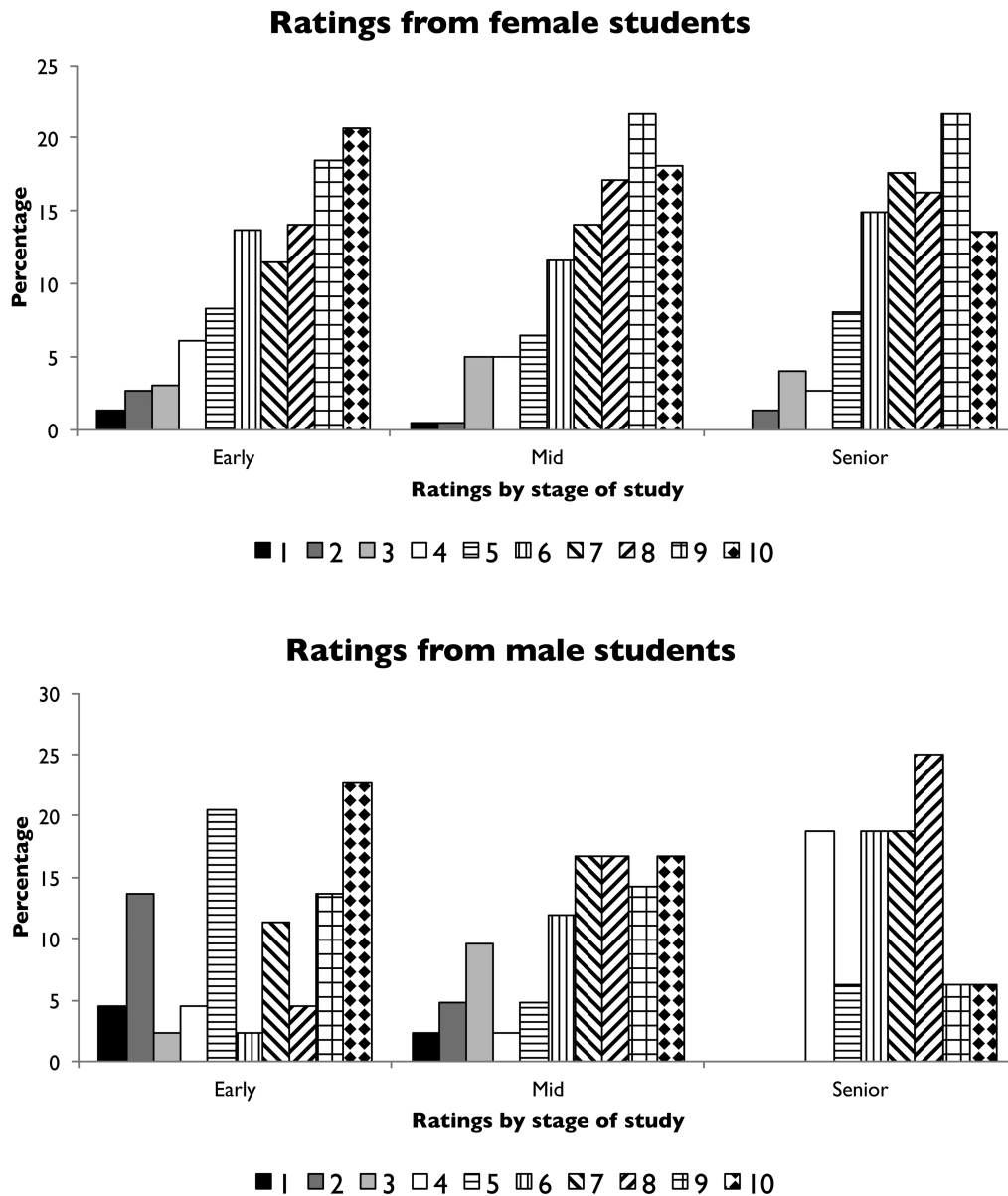


Figure 3: Ratings assigned by (a) female and (b) male students from the early, mid-, and senior stages of study to the importance of understanding perspectives on welfare on their first day in practice (1 = extremely important, 10 = least important)

The importance of an understanding of perspectives on welfare on their first day in practice revealed a significant gender/stage interaction (Table 2). A reduction in importance over time was recorded for female students over the course of the degree, which was not apparent for males (Figure 3). However, the smaller number of male participants ($n = 18$) responding to this statement compared to the number of female participants ($n = 500$) may be responsible for this.

DISCUSSION

In summary, veterinary students rated triage and professional ethics to be the most important Day One Competences. Laws, regulation, and euthanasia were also rated relatively highly. Triage was rated more important

in later years of the program, whereas professional ethics showed an opposite trend, being rated more important in the early and mid-stage of the program than in senior years. In contrast, understanding why animal welfare matters, perspectives on welfare, and development of animal welfare science were rated least important. Few differences were found between male and female students with the exception that female students rated the human-animal bond as a more important topic for their first day in practice than male students.

One possible influence on the relatively high rating of triage and professional ethics is that the main motivations for entering the veterinary profession are very practical (i.e., the enjoyment of working with animals and the desire to help sick and injured animals).^{11,20} It is possible

that students identified these “practical” topics as “competences,” and linking importance of various topics to Day One Competences may have contributed to a bias toward ranking triage and professional ethics more highly. The more practical topics—in particular triage; professional ethics, laws, and regulations; and euthanasia—have immediate AWE implications and consequences, from Day One, and therefore may have been rated more highly. In contrast, knowledge and understanding relating to perspectives on animal welfare, the development of animal welfare science, and the reasons why animal welfare matters may have been viewed as broader knowledge that underpins veterinary practice, rather than a competence per se. It is also possible that some of the more practical topics, triage in particular, influenced the ranks given to all topics. That is, the nature of triage in emergency situations means that it is always likely to be ranked highly, and this may have influenced students to equate “competences” with immediate practical skills, perhaps biasing students to rank less practical skills lower. If so, this effect may reflect the preoccupation of veterinary students with knowledge and skill accumulation rather than understanding the broader aspects of AWE.

The low rating of an understanding of the importance of animal welfare by senior students is concerning in a profession expected to make critical AWE decisions on a regular basis. One possible explanation for this low rating is that the way this topic is worded may not convey the strong feelings, political pressures, and community opinions that often arise concerning animal welfare. The finding that this was rated lower in senior students is consistent with the known lower levels of empathy toward animals in students in the later years of their program,^{21,22} particularly in male students,¹³ though there may be important geographical variations²³ and variations for different classes of animals.²⁴ This apparent desensitization may be a protective mechanism to avoid moral distress, a characteristic that has been identified by veterinary practitioners and students.^{11,25} However, students may be ethically sensitive to animals’ needs without engaging in strong emotional reactions that may compromise their effectiveness to act. Good observational skills of the perspectives of others, and the capacity to imagine the effects of various actions on others, are important aspects of ethical sensitivity, which can be improved through educational interventions. It would be useful, in future studies on this topic, to examine how the emotional impact of statement wording influences the ranks given by students.

One important consideration is to examine how ethics’ instruction is undertaken within veterinary programs. Research on the development of ethical behavior in the sciences indicates that separate, interactive courses based around seminars were more successful in teaching ethics than embedded courses using traditional teaching methods.²⁶ Effective educational tools include instruction on using animal ethics frameworks for decision making and participation in animal ethics scenarios that present a moral conflict or dilemma.²⁷ Similarly, a 3-hour interactive small-group workshop on moral development theory and ethical decision making applied to real animal ethics’ issues was effective in increasing principled (as opposed

to personal) interest and reasoning, but giving students similar information in a 50-minute lecture format had no effect on their reasoning method.¹⁵ Recognizing students’ motivations to study veterinary science suggests the need to engage them in applying knowledge and skills for moral behavior to practical real-life AWE issues. Research on the effect of animal welfare teaching on veterinary student attitudes also indicates that these are, to some extent, malleable.²¹ However, further work is necessary to develop effective AWE veterinary teaching programs to ensure development of Day One Competences.

We acknowledge that the volunteer response rate (just over 25%) gives a potential for bias in the results, as students with a particular interest in AWE may have been more likely to complete the survey. In addition, the topics that students had to rate under animal ethics did not identify all the key components of ethics for development (i.e., moral sensitivity, judgment, motivation, and implementation). These were deliberately excluded as the lack of understanding of these four components and how moral behavior can be developed, both theoretically and practically, would have made it unlikely in our view that students could reliably rank them.

In conclusion, for their first day in practice, veterinary students prioritized triage and professional ethics over some underlying AWE theory and frameworks. The ranking of various topics appears to reflect the students’ preoccupation with accumulating knowledge and practical skills necessary for the first day of practice. This has implications for the teaching of AWE so that students can readily identify their practical components and application.

ACKNOWLEDGMENTS

Support for this publication has been provided by the Australian Government Office for Learning and Teaching. The views in this publication do not necessarily reflect the views of the Australian Government Office for Learning and Teaching. We thank two anonymous reviewers for their helpful and insightful suggestions.

AUTHOR INFORMATION

Rafael Freire, BSc (Hons), PhD, is Senior Lecturer in Animal Behavior and Welfare at the School of Animal and Veterinary Sciences, Charles Sturt University, Wagga Wagga, NSW 2650 Australia. Email: rfreire@csu.edu.au. His research interests include animal welfare education and the normal and abnormal behavior of captive vertebrates.

Clive J. C. Phillips, MA, PhD, is Foundation Professor of Animal Welfare and Director of the Centre for Animal Welfare and Ethics, School of Veterinary Science, University of Queensland, Gatton, QLD 4343 Australia. His research interests include attitudes toward animals, the welfare of farm, zoo, and domestic animals, and animal ethics.

Joy M. Verrinder, BA, Dip T, MBA, MA, is a PhD Candidate at the Centre for Animal Welfare and Ethics, School of Veterinary Science, University of Queensland, Gatton, QLD 4343 Australia. Her research interests include moral behavior and animal ethics, particularly animal ethics education in veterinary science, animal husbandry, and biological and social sciences.

Teresa Collins, BVSc, PhD, MANZCVS (Animal Welfare), is Senior Lecturer in Animal Welfare and Ethics at the School of Veterinary and Life Sciences, Murdoch University, Murdoch, WA 6150 Australia. Her research interests include developing objective methods of welfare assessment and on-farm behavioral assessment.

Chris Degeling, BVSc, PhD, is a Research Fellow at the Centre for Values, Ethics and the Law in Medicine, School of Public Health, University of Sydney, NSW 2006 Australia. His research interests include the social and cultural determinants of human and animal health, One Health, and public health ethics.

Anne Fawcett, BA, BSc (Vet), BVSc, MVetStud, GradCertEducStud (Higher ed), is a lecturer at the Faculty of Veterinary Science, University of Sydney, NSW 2006 Australia. She is also a companion-animal veterinary practitioner. Her research interests include human–animal interactions and veterinary ethics.

Andrew D. Fisher, BVSc (Hons), PhD, is the Chair of Cattle and Sheep Production Medicine at the Faculty of Veterinary and Agricultural Sciences, University of Melbourne, VIC 3010 Australia. He is a Fellow of the Australian and New Zealand College of Veterinary Scientists (Animal Welfare).

Susan Hazel, BVSc, PhD, is a Senior Lecturer at the School of Animal and Veterinary Sciences, The University of Adelaide, Roseworthy Campus, Roseworthy, SA 5371 Australia. Her research interests include human–animal interactions, animal training methods, and animal behavior and welfare.

Jennifer Hood, BSc (Hons), BVMS, PhD, is employed part-time by the Faculty of Veterinary Science, University of Sydney, NSW 2006 Australia. She also works as a consultant in animal welfare, ethics, and regulatory compliance.

Jane Johnson, PhD, Dip Arts (Hons), BSc Arch. (Hons), Grad. Cert. HED., is employed part-time by the Faculty of Veterinary Science, University of Sydney, NSW 2006 Australia. She is a philosopher interested in applied ethics, interdisciplinary research, and philosophical pedagogy. Her research interests include the ethics of innovative surgery, and the ethical and epistemological implications of re-conceptualizing the use of non-human animals in biomedical research.

Janice K. F. Lloyd, BSc (Hons), PhD, DCR, CVT, AHT, Grad. Cert. Ed. (Academic Practice), is Senior Lecturer in Animal Behavior, Welfare and Ethics at the Discipline of Veterinary Science, James Cook University, QLD 4811 Australia. Her research interests include human–animal interactions, animal training, and animal welfare.

Kevin Stafford, MVB, MSc, PhD, FRCVS, FACVSc, is Professor of Veterinary Ethology at the Institute of Veterinary, Animal and Biomedical Sciences, Massey University, Palmerston North, 4442 New Zealand. In 2004, he was awarded a Fellowship of the Royal College of Veterinary Surgeons for his work on pain in cattle and, in 2010, a Fellowship of the Australian College of Veterinary Scientists in Animal Welfare Science, Ethics and Law.

Vicky Tzioumis, BSc (Hons), PhD, is Project Manager, Faculty of Veterinary Science, University of Sydney, NSW 2006 Australia. She has managed interdisciplinary projects involving the scientific community within the tertiary sector and State and Federal Government departments. She has worked as a project officer/

manager on several educational research projects, including OLT-funded projects (e.g., VIBenet and SaMnet). She has a PhD in marine ecology (University of Sydney) and a broad knowledge of the natural sciences.

Paul D. McGreevy, BVSc, PhD, is Professor of Animal Behavior and Animal Welfare Science at the Faculty of Veterinary Science, University of Sydney, NSW 2006 Australia. His research interests include the welfare of domestic animals, animal training, equitation science, welfare epidemiology, and animal husbandry.

REFERENCES

- 1 McGreevy PD, Dixon RJ. Teaching animal welfare at the University of Sydney's Faculty of Veterinary Science. *J Vet Med Educ*. 2005;32(4):442–6. <http://dx.doi.org/10.3138/jvme.32.4.442>. Medline:16421825
- 2 Stafford KJ. *Animal welfare in New Zealand*. Palmerston North: New Zealand Society of Animal Production; 2013.
- 3 Broom DM. A history of animal welfare science. *Acta Biotheor*. 2011;59(2):121–37. <http://dx.doi.org/10.1007/s10441-011-9123-3>. Medline:21347723
- 4 Webster J. *Animal welfare: limping towards Eden*. Oxford: John Wiley & Sons; 2008.
- 5 Yeates J. *Animal welfare in veterinary practice*. Chichester: Wiley-Blackwell; 2013. <http://dx.doi.org/10.1002/9781118782958>.
- 6 Royal College of Veterinary Surgeons (RCVS). *Day One Competencies* [Internet]. London: RCVS; 2014 [cited 2016 May 31]. Available from: <http://www.rcvs.org.uk/document-library/day-one-competences/day-one-competences-updated-26-march-2014.pdf>.
- 7 Main DC. Evolution of animal-welfare education for veterinary students. *J Vet Med Educ*. 2010;37(1):30–5. <http://dx.doi.org/10.3138/jvme.37.1.30>. Medline:20378875
- 8 Magalhães-Sant'Ana M. Ethics teaching in European veterinary schools: a qualitative case study. *Vet Rec*. 2014;175(23):592–8. <http://dx.doi.org/10.1136/vr.102553>. Medline:25185106
- 9 Platt B, Hawton K, Simkin S, et al. Systematic review of the prevalence of suicide in veterinary surgeons. *Occup Med (Lond)*. 2010;60(6):436–46. <http://dx.doi.org/10.1093/occmed/kqq044>. Medline:20591857
- 10 Rollin BE. Euthanasia, moral stress, and chronic illness in veterinary medicine. *Vet Clin North Am Small Anim Pract*. 2011;41(3):651–9. <http://dx.doi.org/10.1016/j.cvsm.2011.03.005>. Medline:21601753
- 11 Verrinder JM, Phillips CJ. Identifying veterinary students' capacity for moral behavior concerning animal ethics issues. *J Vet Med Educ*. 2014;41(4):358–70. <http://dx.doi.org/10.3138/jvme.1113-153R>. Medline:25335645
- 12 Verrinder JM, Phillips CJ. Assessing veterinary and animal science students' moral judgement development on animal ethics issues. *J Vet Med Educ*. 2015;42(3):206–16. <http://dx.doi.org/10.3138/jvme.0215-022R>. Medline:26200702
- 13 Paul ES, Podberscek AL. Veterinary education and students' attitudes towards animal welfare. *Vet Rec*. 2000;146(10):269–72. <http://dx.doi.org/10.1136/vr.146.10.269>. Medline:10749039

- 14 Arluke A. The use of dogs in medical and veterinary training: understanding and approaching student uneasiness. *J Appl Anim Welf Sci.* 2004;7(3):197-204. http://dx.doi.org/10.1207/s15327604jaws0703_6. Medline:15498727
- 15 Self DJ, Olivarez M, Baldwin DC Jr. The amount of small-group case-study discussion needed to improve moral reasoning skills of medical students. *Acad Med.* 1998;73(5):521-3. <http://dx.doi.org/10.1097/00001888-199805000-00019>. Medline:9609864
- 16 Lee WT, Schulz K, Witsell D, et al. Channelling Aristotle: virtue-based professionalism training during residency. *Med Educ.* 2012;46(11):1129-30. <http://dx.doi.org/10.1111/medu.12000>. Medline:23078720
- 17 Herzog HA Jr, Vore TL, New JC Jr. Conversations with veterinary students: attitudes, ethics, and animals. *Anthrozoos.* 1989;2(3):181-8. <http://dx.doi.org/10.2752/089279389787058019>.
- 18 de Graaf G. Veterinary students' views on animal patients and human clients, using Q-methodology. *J Vet Med Educ.* 2007;34(2):127-38. <http://dx.doi.org/10.3138/jvme.34.2.127>. Medline:17446638
- 19 Izmirlı S, Yigit A, Phillips CJC. The attitudes of Australian and Turkish students of veterinary medicine towards animals and their careers. *Soc Anim.* 2014;22(6):580-601. <http://dx.doi.org/10.1163/15685306-12341352>.
- 20 Daly RF, Erickson AK. Attitudes toward becoming a veterinarian in a group of undergraduate agriculture and biomedical sciences students. *J Am Vet Med Assoc.* 2012;241(9):1169-77. <http://dx.doi.org/10.2460/javma.241.9.1169>. Medline:23078562
- 21 Hazel SJ, Signal TD, Taylor N. Can teaching veterinary and animal-science students about animal welfare affect their attitude toward animals and human-related empathy? *J Vet Med Educ.* 2011;38(1):74-83. <http://dx.doi.org/10.3138/jvme.38.1.74>. Medline:21805938
- 22 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):253-7. <http://dx.doi.org/10.3138/jvme.0114-006R1>. Medline:24981422
- 23 Phillips CJC. Effects of field of study on university students' attitudes towards animal issues. *Anim Welf.* 2014;23(4):459-66. <http://dx.doi.org/10.7120/09627286.23.4.459>.
- 24 Levine ED, Mills DS, Houpt KA. Attitudes of veterinary students at one US college toward factors relating to farm animal welfare. *J Vet Med Educ.* 2005;32(4):481-90. <http://dx.doi.org/10.3138/jvme.32.4.481>. Medline:16421832
- 25 Batchelor CE, McKeegan DE. Survey of the frequency and perceived stressfulness of ethical dilemmas encountered in UK veterinary practice. *Vet Rec.* 2012;170(1):19. <http://dx.doi.org/10.1136/vr.100262>. Medline:22084032
- 26 Antes AL, Wang X, Mumford MD, et al. Evaluating the effects that existing instruction on responsible conduct of research has on ethical decision making. *Acad Med.* 2010;85(3):519-26. <http://dx.doi.org/10.1097/ACM.0b013e3181cd1cc5>. Medline:20182131
- 27 Mullan S, Main D. Ethical decision-making in veterinary practice. *Vet Rec.* 2001;149(11):339-40. Medline:11583136