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The change in perceived 'importance' and 'usefulness' of veterinary public health during final-year rotations of veterinary students at the University of Liverpool

The global community is facing a challenging twenty-first century, with many disciplines not meeting society's needs with regards to employment and retention of staff; veterinarians are no exception. Worryingly, the shortage of veterinarians within public health roles is predicted to increase within the near future. This pilot study aimed to gain a better understanding of how final-year veterinary students perceive Veterinary Public Health (VPH) at the University of Liverpool during their final-year VPH rotation. To do this, students were categorized into groups based on their stated career destinations and gender, to determine if there is a correlation between the two. We hoped to discover if the perception of VPH in terms of 'usefulness' and 'importance' changed during their final-year rotation week. A paper-based questionnaire was designed and given to students at the beginning of their rotation week to complete – Part 1 – whilst Part 2 was completed at the end of the week. In total, 172 students were surveyed across the study period, none of whom expressed a planned career pathway in public health. Overall, 83% of students' scores for two analysed questions regarding 'importance of VPH to the veterinary profession' and 'usefulness of VPH to that student's individual career' improved by at least one point between Monday and Friday. The largest group of students to see an increase were small-animal focused students; where 86% gave a higher score on Friday for both questions compared to Monday. No gender-specific preference was seen between participants expressing an interest in VPH-based careers, and stated gender had no statistical impact on whether a student score increased or decreased between Monday and Friday for both analysed questions.

Keywords: veterinary education, veterinary public health (VPH), employability

Introduction and literature review

It is well documented, both anecdotally and empirically, that the veterinary profession, similar to many other fields (Pershing & Fuchs, 2013), is not meeting society's needs in non-clinical disciplines (Hoblet, Maccabe, & Heider, 2003; Prince, Andrus, & Gwinner, 2006). Qualified veterinarians, as well as veterinary students are not embracing the

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diverse career opportunities available to veterinary graduates, and as such are not meeting society's needs of the profession (Baker et al., 2003). Concerningly, this trend is also seen in a variety of different disciplines; medicine, where important public health concerns of certain communities, regions, and even nations are no longer being met (Philibert & Blouin, 2020), and civil engineering where a move towards information technology is replacing traditional engineering approaches (Christodoulou, 2004), a trend which is slower being altered with the advancement of 'environmental ethics' (Miloradova & Ishkov, 2015). This paper focuses on veterinary public health (VPH) in the higher education curriculum. It will however be of interest to any other disciplines in preparing their graduates for the rapidly changing challenges of our society.

Our global society is facing a challenging twenty-first century; a matter made worse due to the ongoing effects of the coronavirus disease outbreak of 2019 (Roopnarine, Boeren, & Regan, 2021). The veterinary profession is not alone with these challenges, however; since the start of the century, veterinarians have borne witness to notifiable disease outbreaks such as foot-and-mouth disease and highly pathogenic zoonotic avian influenza, threats of bioterrorism, and the huge economic and ethical effects of bovine spongiform encephalopathy (De Rosa & de Balogh, 2005). These events, in addition to the changing landscape of veterinary and human medicine regarding human demographics, global commerce, international travel, microbiological resistance, climate catastrophe, emerging infectious diseases, and human encroachment into wildlife areas, illustrate how interconnected animal health, food safety, and public health truly are (Riddle, Mainzer, & Julian, 2004). The One Health initiative, a transdisciplinary, multisectoral, collaborative approach is one such solution to assist in addressing these key challenges (Kelly et al., 2020). By sharing the burden of these twenty-first century issues across the medical, veterinary, anthropological, biological sciences, and engineering fields, attempts can be made to build multidisciplinary bridges and prevent further planetary degradation (Aguirre et al., 2016). However as Roopnarine et al. (2021) highlight, medical students need greater exposure in their undergraduate curricula regarding the understanding of the wider implications of human medicine. In doing so, they draw linkages across the different disciplines of One Health to become more efficient clinical practitioners upon graduation. Similarly, civil engineers have long been involved in public health (Fisher, Cotton, & Reed, 2006). Only recently however has there been a movement within academic spheres to focus on the environmental impacts of civil engineering with a greater focus on sustainability (Filion, 2010). This move to adopting the One Health framework, by governments, is however gaining global traction with the recent announcement stating a move towards adopting One Health focused policies, by the Group of Seven (G7) in 2021 (The Lancet, 2021) – a move which is likely to have a trickle-down effect into higher education institutions as universities adapt to the expectations of both government and the job market (Gibbs, 2014).

To overcome these global challenges, veterinary colleges will need to diversify their applicant pool and work to retain graduates within VPH careers (Hoblet et al., 2003). This is of crucial importance as it is becoming more apparent that many clinical practi-

tioners fail to consider the possibility of zoonotic disease when working up cases, or ignore the public health implications of zoonotic disease entirely (Cripps, 2000). This is despite zoonotic disease and its public health implications being of crucial importance to the Royal College of Veterinary Surgeons (RCVS), and being an assessed criteria of the Professional Development Phase (PDP) for new veterinary graduates (RCVS, 2020).

It is essential that veterinarians are aware and familiar with the public health implications of zoonotic disease, environmental hygiene, as well as human behaviour for calculating risks. The World Health Organisation defines VPH as 'the sum of all the contributions to the physical, mental, and social well-being of humans through an understanding and application of veterinary science' (quoted in Stewart, Cowden, McMenamin & Reilly 2005, p.1213). This definition underpins the multidisciplinary approach and wide scope of VPH. However, this wide scope appears to be taught by only a few veterinary school across both Europe and America, whilst in many schools VPH simply refers to meat hygiene (De Rosa & de Balogh, 2005). This is a worrying trend, as in 1986 the Pew Charitable Trust formed a commission to analyse the veterinary profession in detail (Howl & Walters, 2001). Their findings were published in 1989 and stated that there was a serious shortage of veterinarians in public sector roles. Unfortunately, this trend has continued (Riddle et al., 2004), with multiple countries relaxing visa requirements for public health veterinarians trained overseas to prevent workforce demands increasing further (MPI, 2018).

Cripps (2000) believes that, for clinicians, there are limited resources available to investigate zoonotic disease, despite this being a key aspect of VPH. Furthermore, he states that VPH is often ignored by public health policy. This is a belief which many veterinarians working within the field of population health would share. However, it is in stark contrast to the historical public belief stated by Hoblet et al. (2003), who discuss how public support for veterinary education has often stemmed from the profession's active involvement within VPH. Traditionally, VPH has been an integral component in creating cross-disciplinary bridges between agriculture and human health. Such collaboration has seen an improvement within food security and safety, better knowledge, and thus, control of zoonotic disease and enhanced regulatory frameworks which promote animal and human health (Hoblet et al., 2003). Within this capacity, the importance of VPH is well documented and its benefits obvious. Furthermore, VPH is more recently regularly utilized in the developing concept of 'One Health' and 'One Welfare', global multidisciplinary approaches seeking to improve the lives of both humanity, animals, and the environment as whole (Pinillos et al., 2016; Zinsstag, Schelling, Waltner-Toews, & Tanner, 2011). However, both Cripps (2000) and Hoblet et al. (2003) agree that recent trends, both within the veterinary profession and within the general public, have shown the unique link provided by veterinary medicine and public health has increasingly diminished to the point where it has become overlooked by policymakers, resulting in a decrease of the subjects' ability to strive for change.

Recently, the demographics of the veterinary population has changed, both within the United Kingdom (Fosgate, 2008) and internationally (Kendall, 2004). While previously veterinarians were predominantly Caucasian males from a rural upbringing, as of late, this trend has changed to the point where they are now predominantly female

from suburban backgrounds (Fosgate, 2008). This has been a suggested reason for the reduction in the number of veterinarians choosing non-small-animal focused careers (Jacobs, 2006; Narver, 2007). Wise and Lloyd (2003) documented that the most common career for a female veterinarian is small-animal clinical practice. Conversely, Fosgate (2008) discusses how male veterinarians more commonly choose a career within production animal practice. With recent changes in veterinarian demography resulting in the higher predominance of female veterinarians, this could explain a change towards small-animal focused careers.. These gender differences are something explored within this short study.

Despite the diverging career options of either gender, the majority of American students enter veterinary school with the desire and expectation to practice small animal medicine' (Hird, King, Salman, & Werge, 2002, p. 205). This could be due to changes in the veterinary curriculum wherein the majority of veterinary schools have moved towards a small-animal focus as the amount of student debt is increasing (Grant, 2019), and a small-animal career is viewed as the most well-paying veterinary career pathway (Wise & Lloyd, 2003). Therefore, the use of past data for direct comparisons is not optimal for determining appropriate mitigation strategies (Fosgate, 2008). Anecdotally, we can assume that, for Liverpool and even the UK as a whole, the majority of students will be looking for a career in small-animal practice. However, student motivation towards this career path is largely unknown, with some authors suggesting the increase could be due to the 'romanticism' associated with the increased number of veterinary-based television shows (Lamb, 2018). Alternatively Fosgate (2008) hypothesizes that this shift to small-animal focused careers could be due to market forces, as opposed to a simple disinterest in public health. Regardless of causation, the trend is noticeable, and unfortunately student motivation is a topic which is too broad for analysis in this pilot study.

Despite these discussed opinions and perceptions, some veterinary students do express an interest regarding careers within VPH. However, these students often express concern regarding the lack of curricular opportunities to develop skills within this field (Ikuta et al., 2006; LaBranche et al., 2003). This has caused the American College of Veterinary Preventive Medicine to develop a voluntary curriculum for teaching veterinary students (Fosgate, 2008). Conversely, the European College of Veterinary Public Health has yet to do this for veterinary schools within Europe. However, anecdotally, colleagues within the University of Liverpool and in other UK veterinary schools who teach VPH generally agree that the vast majority of students demonstrate no interest or minimal interest with the subject, preferring to 'learn just what is required to pass exams'.

Study aims and research question

The aims of this short pilot study are:

- to gain a better understanding of how final-year veterinary students at the University of Liverpool perceive VPH:
  - categorize the students within perceived career destinations and gender, to determine if there is a correlation

- discover if perception of VPH, both 'usefulness' and 'importance', changes during the final-year rotation of the Bachelor of Veterinary Science (BVSc) programme.

The research question of this short pilot study is:

- do veterinary students at the University of Liverpool understand how important and useful VPH is to their future careers and to the global job market?

Materials and methods

The rationale behind undertaking a survey for this research is due to surveys being a traditional and well-tested method for conducting research with particular usefulness for non-experimental descriptive designs that seek to describe reality (Mathers, Fox, & Hunn, 1998). As such, the survey approach is frequently used to collect information on attitudes and behaviour (Siraj-Blatchford & Siraj-Blatchford, 2002). Questionnaire surveys are a common method of data collection within academia, and can be divided into traditional approaches such as telephone or face-to-face interviews, paper-based in person or postal surveys, or a modern approach such as the online survey (Regmi, Waithaka, Paudyal, Simkhada, & van Teijlingen, 2016). The questionnaire utilized in this study was designed by the VPH team at the University of Liverpool and was a traditional paper-based questionnaire. The rationale for this was that despite online surveys now being one of the most popular methods of data collection (Saleh & Bista, 2017), the survey needed to be designed around the practicalities of the VPH rotation. During the final year of the BVSc programme, between four and seven students complete a week-long 'rotation' with a member of the VPH team. This week included small group teaching seminars and tutorials, practical sessions and off-site excursions to food processing facilities. Clinical rotations are proven successful as a method of student centred learning (Daelmans et al., 2004) and ensure students meet the regulatory requirements of the RCVS Day One Skills (RCVS, 2002).

A paper-based survey was chosen as a quick and effective method of gauging opinions (Siraj-Blatchford & Siraj-Blatchford, 2002) as running the survey online had been documented to achieve lower response rates in comparison to paper-based surveys where time is provided to participants (Nulty, 2008). As such the students were provided timetabled time to complete it during the rotation week.

The questionnaire was completed by the final-year veterinary students, at 9 am on the first day of their rotation week (Monday), and at 3 pm on the last day of their rotation week (Friday). The time frame was limited – one week – due to the constraints of the BVSc programmes central timetabling. The survey used in this study had a quantitative methodology to evaluate student opinion on VPH, focusing on comparing how attitudes change at the beginning to the end of the week. The questionnaire comprised of predominantly closed-ended questions, which included those that required participants to indicate their responses on a numerical scale; one being least important, five being most important. One open-ended question (section 2 question 9) provided a free writing space for students 'Do you have any other comments that you think are

relevant to the VPH clinical rotation week? If so, please write them in the space below', allowing the possibility for qualitative data. In total, the questionnaire consisted of thirteen questions or parts thereof regarding veterinary related topics, anticipated career path, and personal information such as gender identity.

The survey was entirely anonymous as this was important for perceived honesty in responses (Mathers et al., 1998). To ensure anonymity was maintained, the VPH member of staff leading the week was not present when the students were completing the questionnaire, and all surveys were placed into a box by the students once they had completed it. To ensure correct identification and correlation of both Part 1 and Part 2 of the questionnaire, a unique six-digit identification number was present in the top left-hand corner of the questionnaire. The number was randomly generated by Microsoft Excel prior to printing.

Data was stored on an Excel spreadsheet (Microsoft) and means, median, mode, standard deviation, and standard error was calculated. Paired t-tests were undertaken using MiniTab (Pennsylvania State).

Results

The analysis of data for this pilot study used descriptive statistics, and focused on the gender of the students, their expressed career path, and questions 2, 3, 5, and 6 of the questionnaire.

In total, 172 students out of 185 in their final year of rotations at the University of Liverpool completed the survey. No students decided not to participate despite the study being voluntary. Thirteen students from two rotation weeks were outside of the survey window, and although were asked to complete the survey to improve rotation teaching, their data has not been used for this study. Of all the students who participated, 82% were female, 16% were male, 1% identified as other and 1% chose not to say (Figure 1).

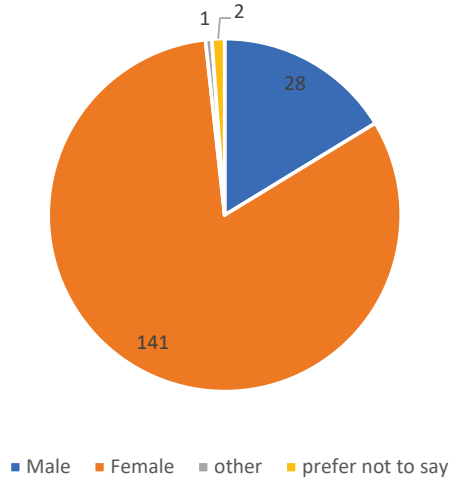

Figure 1 Number of students who completed the questionnaire and their stated gender.

The vast majority of students questioned, as predicted, expressed a desire to be a small-animal clinician upon graduation (Figure 2). We also found a strong correlation between the percentage of women stating this was their preferred career pathway; 84% of students who described themselves as females also stated a desire to be a small-animal vet, as opposed to 23% of male students, whilst 60% of male students expressed an interest to enter production animal practice compared to only 5% of female students. Regardless, no students expressed a desire to enter government or VPH related jobs on completion of Part 1 of the questionnaire.

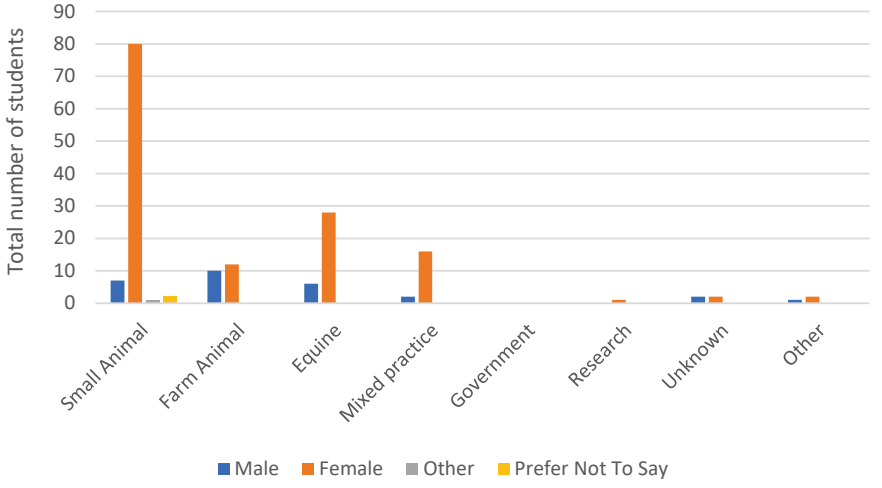

Figure 2 Students' self-described gender and anticipated career paths of the students completing the questionnaire.

The two questions analysed as part of this pilot study were repeat questions. Question 2 was asked on Monday morning; 'How important and/or relevant do you consider veterinary public health to be to the veterinary profession in the UK?'. This was repeated on Friday afternoon as question 5. Similarly, question 3 which was: 'How important and/or relevant do you consider veterinary public health will be to you personally in your future anticipated career?' was repeated as question 6 on Friday. The scores were assigned on a linear scale of 1–5, where one was the least important/relevant and five was the most important/relevant.

Figures 3 and 4 display the student assigned score to question 2 and 3 on Monday and 4 and 5 on Friday. Error bars are displayed as standard error, the standard deviation for question 2 was 22.9, for question 3 was 12.5, for question 5 was 21.6 and question 6 was 17. The mean number of students for all questions was 34.4.

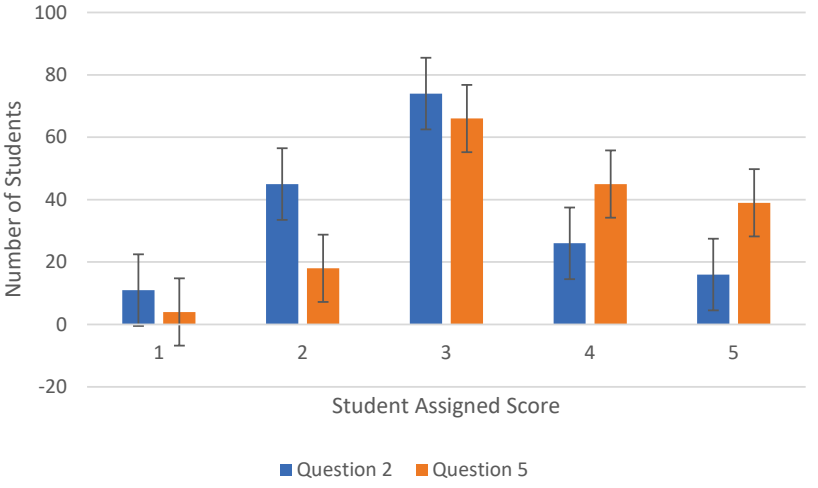

Figure 3 Assigned scores of students to question 2 and 5 regarding veterinary public health's perceived importance to the veterinary profession.

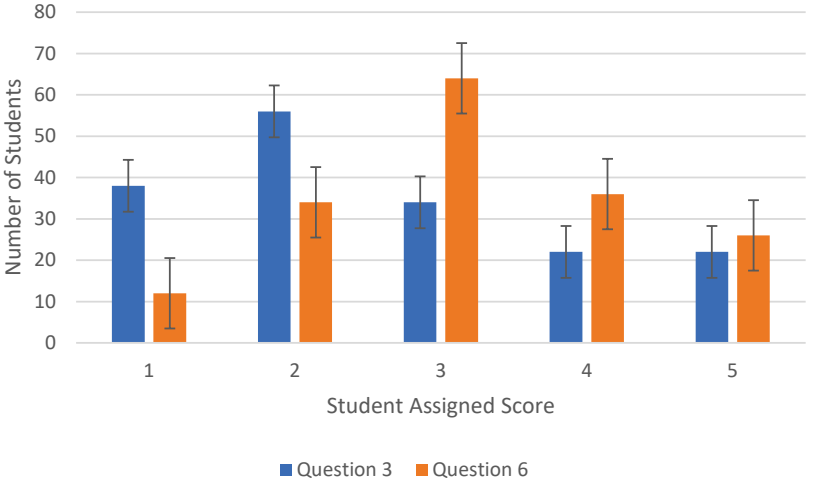

Figure 4 Assigned scores of students to question 3 and 6 regarding veterinary public health's perceived importance to the individual student's veterinary career.

Statistically, the difference among the answered questions between Monday and Friday were insignificant on a paired t-test. Furthermore, the modal scores remained static between Monday and Friday; all questions had a mode score of three. Anecdotally however, it is possible to see that the normal distribution has shifted to the right indicating more students are scoring the questions higher, suggesting that the majority

of students changed their opinion after completing the rotation. Moreover, this is also reinforced by Figure 5, which shows that the majority of students scores increased by a score of one or more between Monday and Friday.

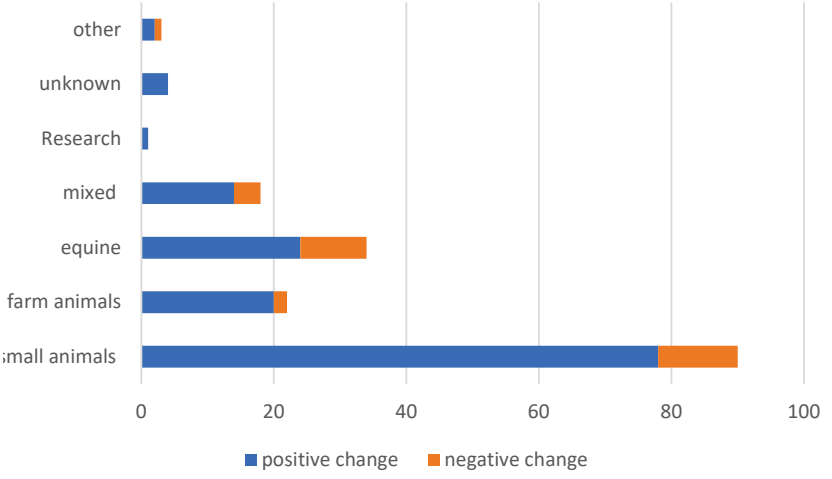

Figure 5 Number of students whose scores for question 2 and 3 increased (positive change) or decreased (negative change) from Monday to Friday.

The responses to question 9 of Part 2 of the survey included various statements regarding how the students' perception of VPH had improved over the week: 'I was not looking forward to this rotation but I've actually really enjoyed it', as well as helpful feedback for the VPH lecturers: 'The field trip to the creamery and abattoirs were excellent, we should do more of this'.

Discussion and conclusion

The shortage of veterinarians within public health roles, predicted by Hird et al. (2002), has been confirmed to be a problem to the British economy. A lack of interest within public health roles, coupled by both Brexit and the coronavirus pandemic, has resulted in a crisis at British ports and an inability to trade animal by-products in a manner we were previously accustomed to (Hartwell, 2021). It is of crucial importance for veterinarians to take on roles within VPH as well as for the veterinary profession to train new recruits for these roles. This could be achieved by staff moving from other fields into VPH, through changes to veterinary curricula, or through allowing students to 'track' whilst at vet school to develop VPH related skills (Ikuta et al., 2006). No students who responded to our questionnaire expressed a planned VPH career pathway at the beginning of the week. This is similar to Fosgate (2008) who had 2.6% of students express a VPH career path. However, we only surveyed 172 students in

their final-year rotation of the University of Liverpool's Bachelor of Veterinary Science (BVSc) programme, compared to their 508 students of varying veterinary degree stages. Both of our findings support the anecdotal belief that the vast majority of vet students do not have a strong interest or desire to work within VPH. Currently there are two main theories as to why this is, Hoblet et al. (2003) suggest that this could be due to the profession's inability, as a whole, to communicate effectively regarding VPH's importance. The other, which is specific to the United Kingdom, is that the salary threshold for VPH veterinarians is comparatively very low compared to clinical practice (Grant, 2019).

Both Fosgate (2008) and this study's findings share similarity in that the majority of students were aiming to enter small-animal clinical practice. Andrus, Gwinner, and Prince (2006) demonstrate however that at least 20% of veterinary surgeons will change their career focus with time, often due to external factors such as work-life balance. etc. What is encouraging across our results is that 83% of students improved their scores (positive change) by at least one point between Monday and Friday, across both importance of veterinary public health to the veterinary profession and usefulness of VPH to themselves. Interestingly, small-animal focused students had the greatest increase in point score, with 86% giving a higher score on Friday compared with Monday. This is encouraging and maybe illustrates a changing attitude towards VPH and, whilst it may not necessarily mean more VPH veterinarians, it might mean that more veterinarians will have a better understanding of zoonotic disease and its importance whilst in private practice.

It also hopefully suggests that Cripps's (2000) theory of veterinarians not taking zoonosis seriously is no longer as true as previously anticipated. However, as these results are not statistically significant, no major conclusions can be drawn from this data. Despite this, answers from question 9 of Part 2 of the survey are encouraging, statements such as 'It now seems to make sense', 'I have just started to understand why this is necessary' and 'Finally I see the point of why vets need to know this', are a credit to the VPH lectures at the University of Liverpool and qualitatively demonstrates the tremendous effort they go to in order to make the VPH rotation of 'use' to the students and in how they make VPH overall appear more interesting and engaging.

A major favourite activity of the students during this week was the external visitations to food producing locations such as a local creamery and red and white meat abattoirs. These visitations appear to have linked the theoretical content of the week to the real-life implications of the discipline. This approach is of course well documented throughout many areas of education with field trips assisting with student-centred learning (Galbraith, 2012). Moreover, these life-applicable tasks are documented to increase engagement and the generation of memorable learning through the design of activities by effective educators (Aitken & Sinnema, 2008). What is interesting however, is how this question provided space for the students to provide honest feedback comments such as 'I really hated this topic in younger years but now I see it's actually cool'. These statements allowed VPH staff to reflect on how to improve

the didactic component of the curriculum taught in the younger years of the BVSc course (years one to four). Whilst it is not feasible to take 180 students on field trips, increasing the practical component of the discipline's teaching is an area worthy of exploration and has been demonstrated to be successful in other fields of education (Kumar, Freeman, Velan, & De Permentier, 2006).

With regards to antiquated gender roles and the anecdotal perception that people from urban environments are less likely to engage or interact with VPH or even production animal practice as a whole (Narver, 2007; Serpell, 2005), further quantitative data collection is required. In this study 83% of female participants expressed desire to enter small-animal based clinical work which is similar to results stated by Wise and Lloyd (2003). However, as no gender-specific preference was seen between participants expressing an interest in VPH--based careers, we cannot confirm whether gender has any effect on the profession's opinion of VPH. Furthermore, stated gender had no statistical impact on whether a student score increased or decreased between Monday and Friday for both analysed questions. Rather, similar to Fosgate (2008), it is our belief that more data is necessary; across both the UK and Europe, and this is something the European College of Veterinary Public Health (ECVPH) and the European Association of Establishments for Veterinary Education (EAEVE) could explore further to ensure that potential biases which exist surrounding admission policies of veterinary colleges are eliminated. However, this is a topic far broader than the scope of this pilot study. This study is in agreement with Fosgate (2008), that the scale of the issue must first be quantifiably defined and that predictors of VPH interest are identified before we implement procedures aimed at increasing the number of veterinarians within VPH roles.

A major limitation of this study was its lack of quantifiable statistical significance. However, question nine of Part 2 of the survey which required qualitative analysis has provided excellent opportunity for staff reflection and potential curricula adjustment. Going forward, this questionnaire will be further adapted to be more qualitative or mixed methods in its approach and will make use of 'themes' similar to that of Roopnarine et al. (2021) to better categorize student opinion regarding VPH's 'importance' and usefulness.

To conclude, this pilot study has demonstrated that final-year veterinary students at Liverpool University vet school's perception of VPH's importance improves following completion of the VPH rotation. However, as the results were not statistically significant, only tentative conclusions can be drawn and it is thus our recommendation that this study forms the basis of future work with larger cohort numbers as well as a truly mixed-methods approach to discern students' opinions regarding VPH. In the meantime, more work is needed to ensure that the VPH course stays dynamic, adaptable, and relevant to the changing world of the twenty-first century. Despite the issues surrounding Brexit, we will be bringing these findings to the ECVPH with the aim of expanding data collection across European vet schools, to better enable us to make a truly forward-thinking VPH curriculum.

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